Advantech Smart City Whitepaper

ADVANTECH

Enabling an Intelligent Planet

Advantech Smart City Whitepaper

Advantech Promotes the Concept and Vision of a Smart City

Smart city developments drive the collaboration, integration, and overall service output of existing industrial chains, presenting an opportunity to transform Taiwan's hardware industry. Advantech hopes to serve as an enabler of a future intelligent planet by assisting industries and governments with realizing the vision of smart cities together.

Interviewee | Chaney Ho, President, Advantech

The term "Smart City" is no longer a new concept. With the rapid development of the Internet of Things (IoT), smart cities are dramatically increasing worldwide, gradually yet subtly becoming a part of everyday life. Advantech is publishing this whitepaper to increase public understanding by sharing success stories from around the world. This allows local governments planning to implement smart cities to learn from previous cases and, together with Advantech, promote the development of smart cities.

Close Collaboration at the Right Time, in the Right Place, and with the Right Person

The formation of smart cities can be considered a manifestation of the concept "at the right time, in the right place, and with the right person." In terms of the right time, according to United Nation estimates, by 2025, the number of megacities with populations that exceed 10 million will reach 29 worldwide, and the urban population will account for approximately 70% of the global population in 2050. Because populations will continue to be highly concentrated in cities, the challenges of urban governance, such as traffic management, safety, and pollution control, are becoming increasingly serious. Consequently, smart city technologies are considered a crucial solution.

Although numerous definitions of the "Smart City" concept have been proposed, generally, a smart city exhibits a resident-centric approach where information and communication technologies are used to resolve problems resulting from urbanization to achieve the goals of operational maximization and energy consumption minimization.

Numerous breakthroughs in the development of global information and communication technologies have been achieved. For example, the average Internet connection speed has become faster than ever, which enables 5G users to download a feature film in an instant. Radio frequency identification (RFID) is considered one of the century's top-10 important technological developments and has been utilized for at least a decade. RFID can be employed to facilitate shopping at malls or convenience stores, borrowing books from libraries, using public transportation, paying parking fees, registering or filling prescriptions at hospitals, and even featured on business cards. In the United States, the idea of incorporating RFID into 100-dollar bills to track the flow of banknotes has also been proposed. These feats would have been impossible using only previous technology.

As large-scale smart city constructions began to develop one after another in key cities worldwide, opportunities for transforming Taiwan's ICT industry have also emerged. Over the last 30 years, advancements in ICT have been the primary focus for Taiwan, forming the developmental foundation for leading intelligence application software firms and system integrators, industrial sensor chains, communication modules, terminal products, and system integration and service applications. Thus, Taiwan can be considered the country most qualified to discuss smart city and IoT technologies.

Furthermore, the various smart city industries are highly connected. Unlike the past, where industries typically emphasized products, in the future, industries are expected to focus on diverse applications that involve substantial innovation. This should provide Taiwan's industries, particularly the system integration industry, which has performed impressively in the past, with opportunities to establish new niches in future industrial chains. Taiwan's geographical location offers

Partnering for Smart City & IoT Solutions

Industrial Cloud & Cloud Networks

Private Cloud

iConnectivity

Transportation IoT Devices Computer On Modules Video and RFID

Power & Energy Environmental & Facility Monitoring Embedded Software

iBuilding/BEMS Industrial HMI Embedded Design-in Services Intelligent Display

Intelligent Systems iRetail & Hospitality iHospital Image & Video Processing

Machine Automation WebAccess+ Digital Healthcare Digital Logistics Industrial PCs

the country an advantage in terms of "being in the right place".

The third consideration is finding "the right person" for collaborations. The smart city and the IoT concept can be divided into the following three levels: Instrumented, Interconnected, and Intelligence. IBM's specialty is Intelligence. The expertise of Chunghwa Telecom and other local carriers is in Interconnected services, 4G, 3G, and secure data transmissions to a cloud. Advantech's capabilities are in Instrumented services at the most fundamental level. As a leading player in the industrial computing and intelligent applications industries, Advantech's products can be found all over the world. Elements that may influence environmental conditions such as temperature, speed, video, etc. can be continuously collected using Advantech computers, scanners, and detection equipment. This data is then transmitted to the cloud for processing and intelligent decision-making, thereby enabling people to make more effective decisions using the information.

Smart City Services Team Assist with Realizing Smart Cities

The industries that constructed the smart city are unlikely to be monopolized by a single company because of the IoT's popularity over the last few years. What is the IoT? It is the integration of automation and information technologies. In Mainland China, the IoT is understood as "the union of two". The transference of information is aimed at combining the computer,

mobile phone, and software industries into the IoT. The various products and systems, as well as information and analyses, form a comprehensive ecosystem that cannot be covered by just one company. Advantech hopes to serve as an enabler of a future intelligent planet and to lead Taiwan's manufacturers onto the international stage by leveraging its advantages. This whitepaper is just the beginning. With the publication of this whitepaper, Advantech aims to illustrate the feasibility of their approach for realizing smart cities to various industries and governments.

In addition, Advantech has established a task-oriented smart city services team to respond to different applications. The smart city services team is not a formal unit in Advantech's organizational structure; instead, it is an applications team focused on smart city applications. This unit will be led by the president of Advantech, Chaney Ho, who aims to collaborate with business unit heads from various industries. During these collaborations, technologies and their practical applications in all aspects of life will be explored. This should allow decision makers to understand how to implement the Smart City concept. Additionally, Advantech plans to promote the mature development of related applications through continuous communication and practice. This is expected to enable Advantech to assist various industries and governments with achieving the vision of smart cities together. □

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About Advantech

Founded in 1983, Advantech boasts more than 7,000 employees in 21 countries and 92 offices worldwide. As an intelligent systems company, Advantech is a leading provider of trusted, innovative products, services, and solutions. In response to the emerging Smart City and IoT Era and diverse market needs, Advantech formed four strategic business groups to serve specific markets such as the industrial automation, intelligent services, embedded, and intelligent systems markets. Through close cooperation with partners, Advantech is able to provide complete solutions for a wide array of applications across a diverse range of industries. Advantech's corporate mission and goal are, "Enabling an Intelligent Planet" and "Partnering for Smart City and IoT Solutions". Advantech will continue innovating to accelerate the evolution of each industry in an effort to become the most influential global corporation in the Smart City and IoT Era. □

D Design Centers
M Manufacturing Centers
C Configure To Order Service Centers
L Logistics Centers
O Onsite Service
R Repair Centers

C L R Milpitas

D Irvine

Cincinnati **D**

Mexico Monterrey **R**

Itajubá **C L R**

Milpitas
USA

Cincinnati
USA

Irvine
USA

Moscow
Russia

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St. Petersburg

C L **Eindhoven**

Roosendaal

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D C L O R **Beijing**

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C **Bangkok**

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C R **Bangalore**

Kuala Lumpur

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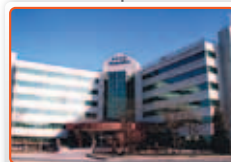
Beijing
China

Taipei
Taiwan

Tokyo
Japan

Itajubá
Brazil

Kunshan
China

Melbourne
Australia

Seoul
Korea

New Look for Smart Cities:
Building People-oriented Lifestyles

To effectively mitigate the issues brought on by rapid urbanization, such as traffic, safety, pollution, and economic issues, and to offer residents more convenient, high-quality lives, some city governments have started to build people-oriented Smart Cities through information and communication technology.

Writer | Lai, I-Hsien
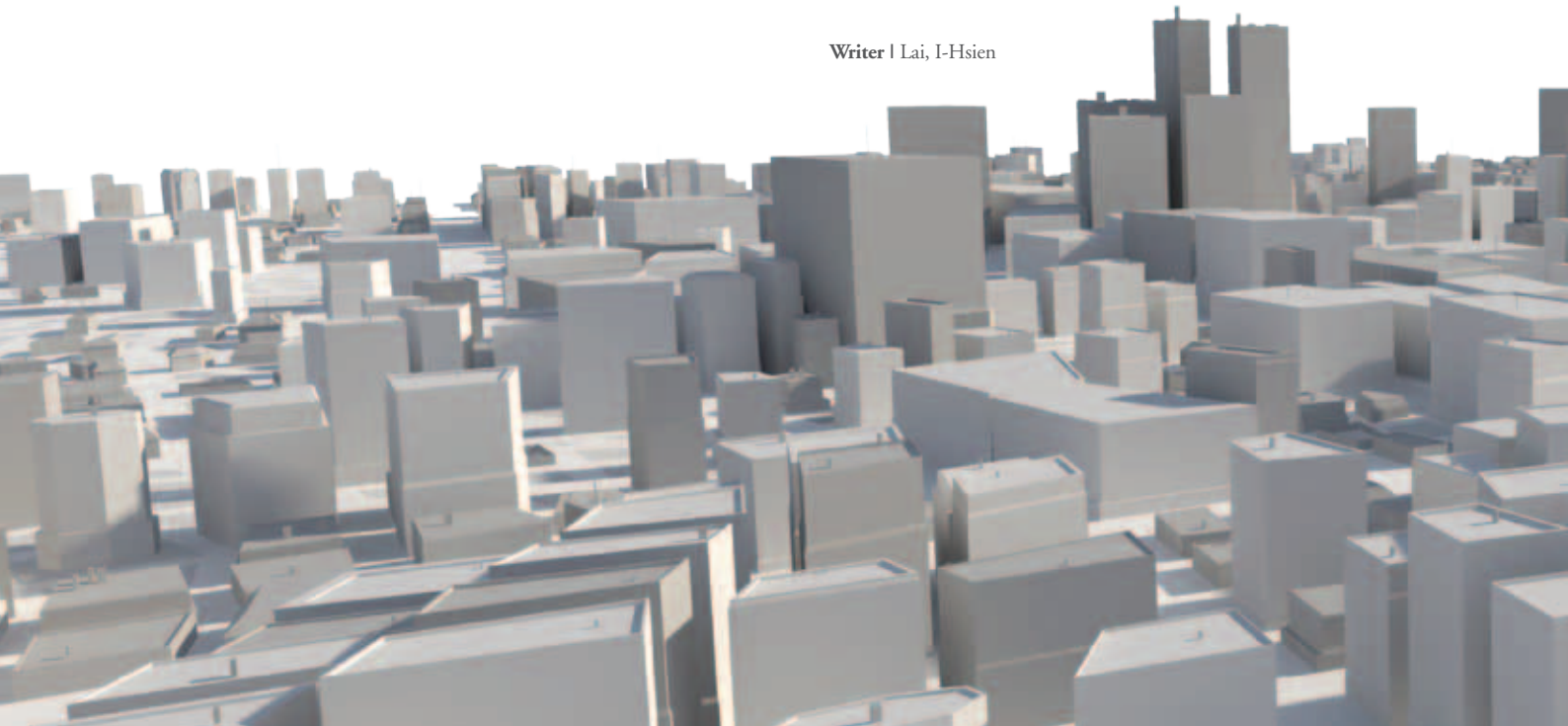
In 1900, only 13% of the global population lived in cities; in 2050, this figure will increase to 70%, and this is occurring in addition to an expected five-fold increase in world population. In other words, every year the world will gain the equivalent of seven New York Cities. As the global population continues to gather in cities, each city undergoes considerable strain in its education, health care, transportation, and public facilities. To effectively respond to citizen needs, relieve the pressure, and achieve sustainable urban development, some cities have begun to address these challenges through information and communication technology. It thus becomes possible to realize the vision of a green smart city.

The Formation and Proliferation of New Smart Cities

The smart city is not a new concept; in the past, because the relevant technologies were not yet mature, the application of smart cities focused mainly on public services. However, new technologies and smart services now come with lower costs, and as a result an increasing number of city governments are establishing smart cities based on cloud computing, mobile

devices, big data analysis, and social networks. These technologies fulfill citizens' requirements regarding basic infrastructure, such as transportation, education, medical care, and police and government operations. This has resulted in a better quality of life in cities, and greater governmental efficiency, and is also a driver of economic development.

For example, the city government of Honolulu, Hawaii, U.S.A. is cooperating with IBM and other partners to establish a "Citizen Collaborative Cloud" where citizens can report transportation and security issues any time and anywhere. Citizens simply take pictures of any problems found, such as a traffic light not working properly, missing vehicles, uneven streets, etc. and upload them to the "Citizen Collaborative Cloud". Then relevant government units formulate improvement plans and report on progress as it occurs. This helps make people's lives more convenient, and improves operational efficiency of the city.

Honolulu's "Citizen Collaborative Cloud" not only allows citizens to report on the operational status of the city in real time, it also allows developers to
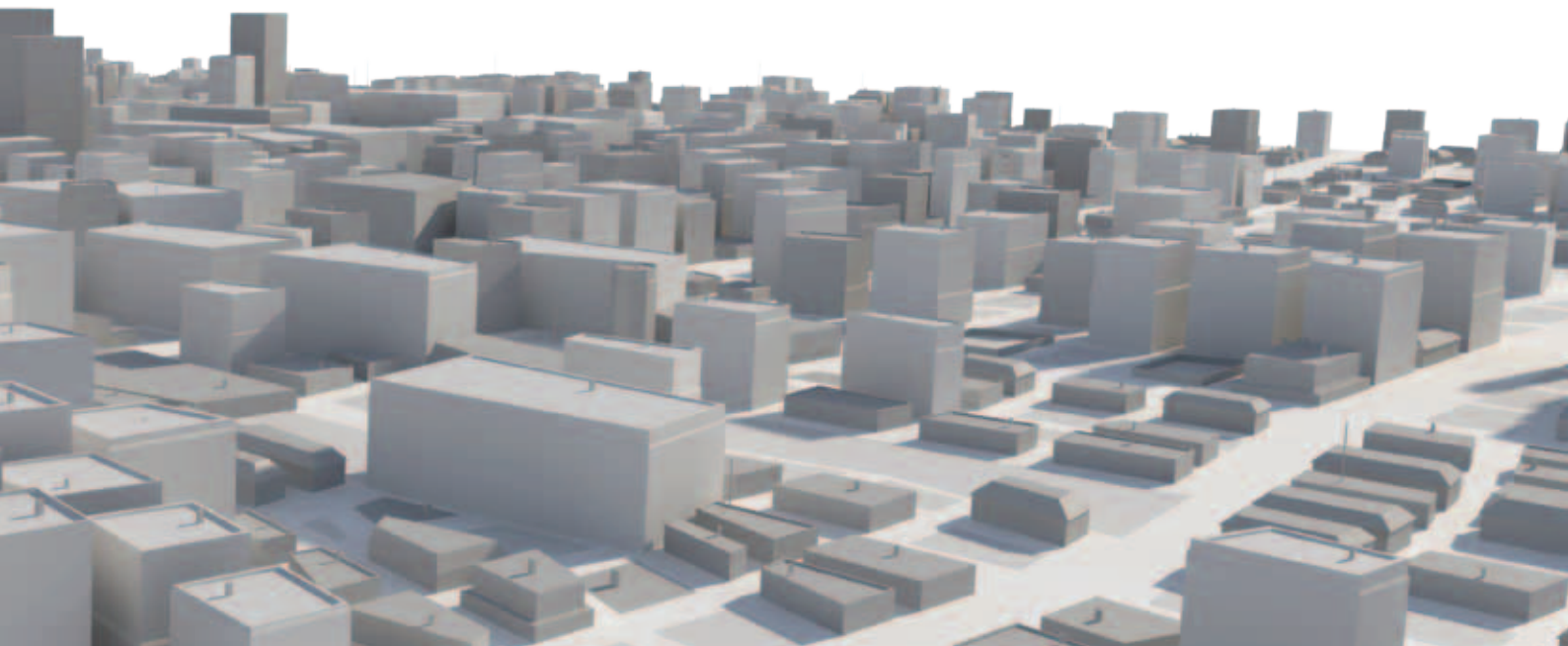
quickly develop creative, cloud-based services that may help improve public service efficiency. For example, CitySourced Honolulu 311 allows citizens to immediately report problems in the city, DaBus can be used to look up the operating status of buses, Adopt-a-Siren lets citizens help monitor the tsunami warning system, Honolulu Tsunami Evacuation Zones allow citizens to look up information and maps for tsunami evacuation in real time, Honolulu Map and Walking Tours provides navigation inquiry services for visitors, and festivals of Hawaii answers inquiries on Hawaii festivals.

Another progressive municipal government is in Amsterdam in the Netherlands, where they have been working actively with AIM (Amsterdam Innovation Motor) and Liander, a telecom operator, to develop a Smart City plan (Amsterdam Smart City, ASC). The goal is to apply green environmental protection to build a sustainable smart city with four key areas of focus: life, labor, transportation, and public space. Specific smart applications include Geuzenveld, a smart meter used to monitor household electricity consumption and display energy feedback; West Orange, a new type of energy

management system that can effectively reduce the electricity consumption of household appliances; ITO Tower, an intelligent building system that effectively reduces energy consumption; and a climate street project that effectively monitors the conditions on the commercial street of Ultrechtsestraat.

In addition to the Americas and Western Europe, Japan and other Asia-Pacific countries are also showing growing interest in the relevant smart city applications. For example, the Japanese government and private enterprises have cooperatively founded the "Japan Smart Community Alliance (JSCA)" to actively implement smart city applications, such as the use of solar energy and intelligent household electric appliances in the cities of Yokohama and Kitakyushu.

These smart city projects shorten the distance between the government and its citizens and improve the quality of life for the people. They also help drive economic development. As a result of these advantages, national governments are now showing increasing willingness to invest in and promote policies relevant to smart cities, and regard them as an important means of boosting municipal economic development.

The Gradual Formation of Smart City Ecosystems in China

The trend toward the Smart City is underway in mainland China too, which is implementing policies such as "Sensing China" and "New Urbanization". It is estimated that in 2015 there will be 800 cities engaged in smart city-related construction, giving rise to business opportunities in the USD 15 billion ICT market.

Thanks to encouragement from China's highest levels, both the central government and local governments are enthusiastically participating in smart cities. All first-tier cities and more than half of the second-tier cities have established the goal of becoming a smart city, in the hope that they will be able to relieve urban issues related to traffic, climate (smog pollution), energy, etc., and implement energy savings and carbon reduction to create a better future.

Ting Pao-Kuei, the senior research manager of China Industry Research and Consulting Services Department, IDC, indicated that after the central and local governments propose detailed policies related to smart cities, the pace of smart city development will accelerate in mainland China, which will gradually improve the market ecosystem related to smart cities. The corresponding vendors of software, hardware, communications, and other services will find their own places, working together and searching for opportunities related to smart cities.

As of today, China's central and local governments have established demonstration applications related to smart cities in the areas of power, transportation, logistics, medicine, agriculture, and environmental protection. Beijing, for example, has built applications related to intelligent transportation, electronic medical records, telemedicine, smart homes, e-commerce, etc. under the "Beijing Platform for Action". Looking to the future, China will not only continue to deepen applications in these areas, but also to further expand the scope of applications in fields such as public safety and environmental protection.

Creating Citizen-centered Smart City Applications

Since truly being a smart city involves a diverse array of issues, it requires collaboration between industry, government, and academia before it can be implemented. Forming a single agency in charge of collaboration related to smart city construction is currently a feasible approach. The city government should assign a Chief Information Officer or a Chief Innovation Officer, to organize a dedicated team to implement the construction of the smart city; be responsible for understanding citizens' expectations of the smart city; plan the scope and structure of applications of the smart city; coordinate cross-departmental units for their support of smart city applications; communicate with cross-disciplinary experts from industry, government, and academia; use appropriate information and communication technologies; look for appropriate partners; and help build an interactive platform beneficial to citizens and relevant organizations that participate and conduct collaborative creativity.

C. Y. Lee, the founder of C.Y. Lee & Partners, once said "technologies develop fast but people move slow". Therefore, the planning process for a smart city should proactively consider the people-oriented aspects, keeping the needs of residents in mind, using appropriate new technologies, and gradually implementing the various applications of smart cities, to ensure the sustainable management of the city.

Of course each city faces different issues and their residents have different needs; therefore cross-disciplinary experts must work together to develop corresponding smart solutions in areas such as safety, transportation, education, energy, etc., and provide the city's government with smart city services including consulting, planning, development, implementation, and maintenance.

As a whole, smart cities have become a new key doctrine for national governments. The infrastructural challenges brought by rapid urbanization can be solved through information and communication technologies by building relevant smart city applications. □
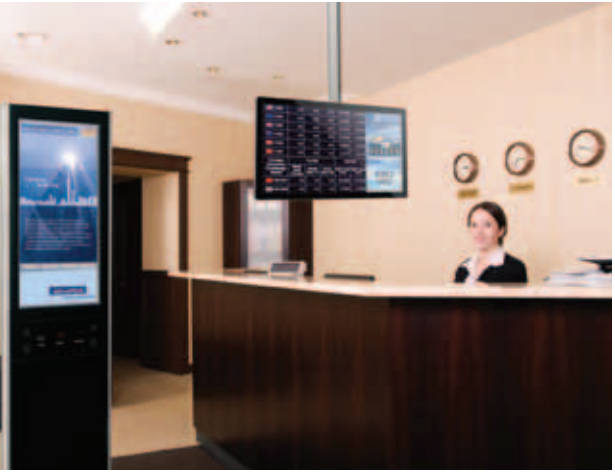
Intelligent Transportation

Intelligent Transportation Systems Create Convenient Transportation Networks

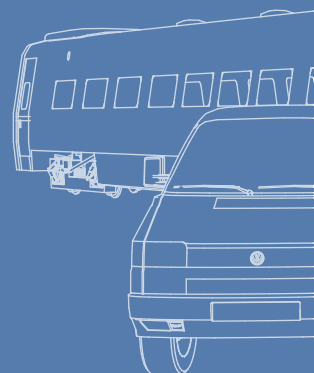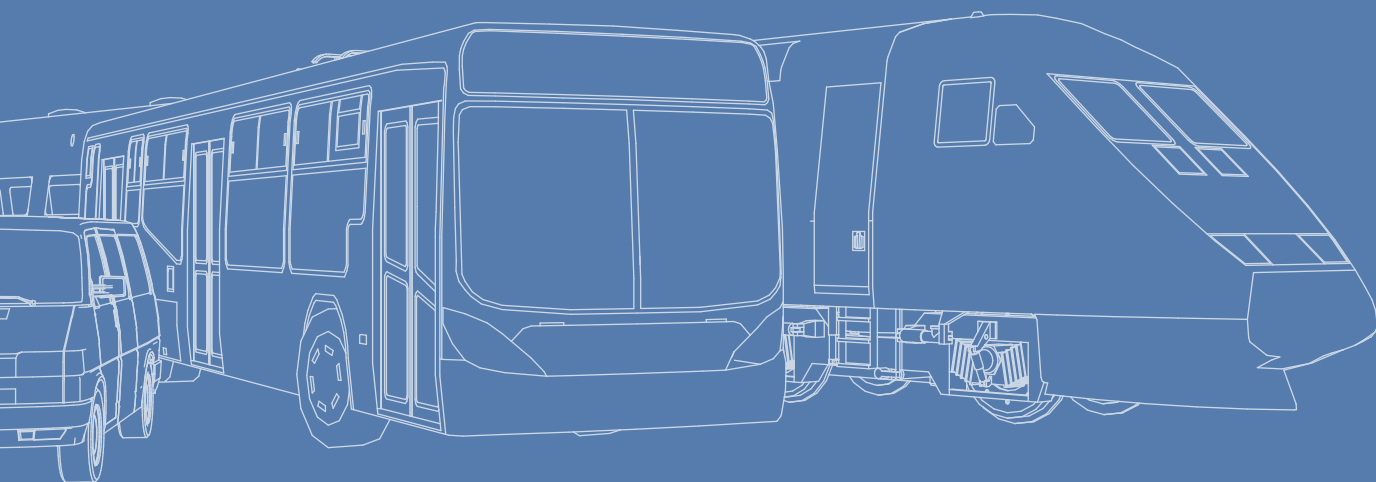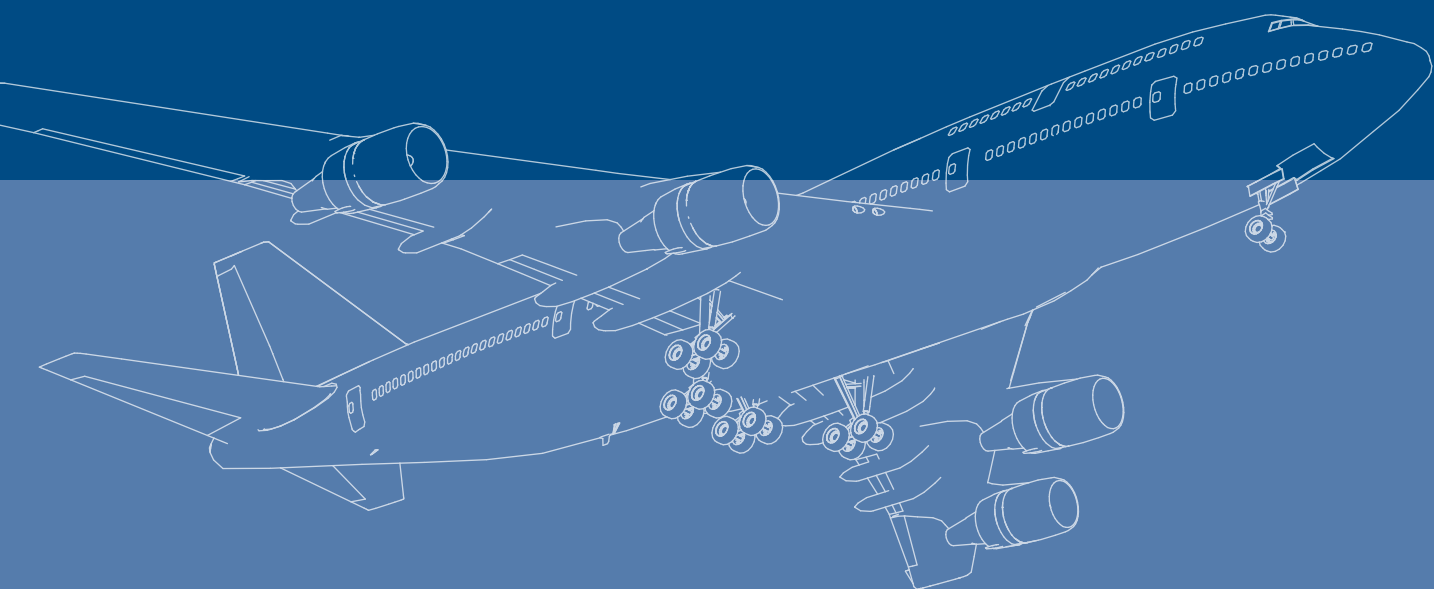Intelligent transportation systems cover three transport sectors: railways, roads, and air travel. To provide products that more closely satisfy user needs, Advantech develops intelligent terminal equipment aimed at various intelligent transportation applications. These developments have reduced the complexity of system integration and accelerated the realization of intelligent transportation.

Writer | Liao, Pei-Chun
Interviewee | Paul Luo, General Manager, Advantech China

The continuing rise in global populations has led to increased road traffic congestion, which not only affects people's quality of life, but also causes environmental problems due to higher carbon emissions. Possible solutions to these issues include improving transportation by, for example, expanding MRT networks, implementing electric vehicles, and promoting intelligent transportation systems. The adoption of information technology can enable authorities to better manage road traffic and ensure people can arrive at their destinations quickly. Thus, the implementation of intelligent transportation systems has become a key development project for national governments. The Japanese information service company, Global Information, Inc., estimated the value of the intelligent transportation market in 2012 to be approximately US$26.7 billion. After 2013, this market is expected to grow at a compound annual rate of 23.6%, reaching a value of US$102.3 billion in 2018.

Using the Railway, Road, and Air Transport Sectors to Construct a Complete Intelligent Transportation Network

Intelligent transportation was first introduced in the United States, followed by Europe, Japan, Australia, South Korea, Singapore, and other countries. In China, with the recent trend in urbanization, an increasing number of people are relocating to towns and cities. Thus, the need to develop intelligent transportation systems and enhance the efficiency of traffic operations is increasing. Because the purpose of intelligent transportation is to resolve local traffic problems, the application patterns differ according to the culture and needs of the area. The YouBike system adopted in Taiwan, the garbage truck fleet management system implemented in Europe, and the intelligent highways constructed in Queensland, Australia, provide examples of these diverse applications.

Paul Luo, General Manager of Advantech's Greater China, indicated that highways located in cities are the primary focus when discussing intelligent transportation in general. However, it seems that the definition of intelligent transportation should be expanded to include railway, subway, and air travel transportation systems. Regardless of the intelligent transportation application type, all require computer systems that can withstand harsh environments and long-term operation. Because the control cabinets for transportation systems are typically installed outdoors and exposed to the elements 24 hours a day, such infrastructure must be able to withstand high and low temperatures, humidity, vibration, dust, and other environmental challenges. All equipment must be sufficiently protected from environmental exposure to ensure stability, which is one of the advantages offered by industrial computers.

Considering railway and subway transport systems (generally referred to as rail transportation), applications of industrial computers can be divided into in two types, onboard (on trains) and off-train (platforms and tracks) applications. Off-train equipment is primarily used for passenger service and security monitoring operations. Passenger service operations include automatic fare collection systems, station information systems, and gate control. Security monitoring operations involve systems for fire alarm monitoring, video surveillance, building automation control, and signal control. Besides train control and management, on-board systems are used to schedule and conduct communication and manage passenger information displays.

Regarding highway transportation, in addition to intelligent bus applications, special vehicle fleet management, and mobile apps for bus timetable inquires; China is currently implementing video surveillance systems integrated with electronic police and public security checkpoints. To implement traffic management at specific intersections, these checkpoints

are equipped with license plate recognition technology for identifying stolen vehicles and discouraging illegal driving behavior. Driving restrictions aimed at combating congestion have also been implemented in large cities such as Beijing, Shanghai, and Guangzhou. Furthermore, in an effort to automate and streamline highway toll systems, industrial computers are increasing employed as electronic toll collection systems.

Air travel is a crucial aspect of intelligent transportation. Thus, Advantech has developed a variety of equipment for constructing intelligent airports, for example, electronic billboards for displaying flight information, boarding gate control systems, Immigration Automated Clearance Systems, and airport vehicle scheduling systems.

Developing Intelligent Terminal Equipment for Various Applications

Although the computer specifications required for intelligent transportation applications are identical, the functional requirements differ slightly. Luo stated that because of the diversity of intelligent transportation applications, each subsystem must be equipped with unique capabilities and functionalities. For example, each subsystem will require a specific number of controllers, I/O interfaces, port number and size, and external appearance. As a provider of high-quality hardware, Advantech must develop intelligent terminal equipment according to the specific requirements of each intelligent transportation application to enable system integrators to conduct convenient implementation.

Of the many purpose-built subsystems implemented to date, the automatic fare collection (AFC) system developed for railways is considered a very successful design. Previously, system integrators would construct AFC systems based on an Advantech single-board computer integrated with additional components. However, Advantech now offers all-in-one solutions

that can be customized according to the application requirements. Such AFC system can be equipped with onboard RAM/DRAM memory, 6 to 12 serial ports, and 2 to 3 VGA ports, thereby reducing the system size through modularization and unique circuitry. This ensures that these purpose-built machines are lightweight, stable, and satisfy all functional requirements to reduce the time and costs of system integration. Advantech also monitors technology trends to identify the latest and most stable technologies to incorporate into its machines and thus continue expanding and developing the intelligent transportation industry.

Fairly early on, Advantech successfully identified the intelligent transportation development trends, such as big data and combining cloud computing with traffic management. Consequently, Advantech has already established a good foundation in this market. In today's China, Advantech solutions can be seen wherever rail transportation exists. Additionally, at least 50% of highway toll stations, and over 80% of the airport flight information display system market, use Advantech equipment. To more accurately understand the extensive and unique requirements of the Chinese market, Advantech established an intelligent transportation department in Shanghai last year. The intelligent terminal equipment designed by this department is expected to more closely satisfy user needs and thus secure Advantech's position as an industrial development leader.

Regarding the future development of intelligent transportation, Luo asserts that collecting traffic information using various application systems, providing a range of travel-related services such as traffic signs and mobile apps based on big data analysis, and ensuring a convenient, efficient, and safe traffic environment will be the primary goals for national governments aiming to construct intelligent transportation networks. □

Taiwan's YouBike Combined with the MRT Network for a Low-Carbon Life

YouBike is a public bicycle sharing service established by the Taipei City Government and officially launched in November 2012. Currently, a total of 167 rental stations have been installed throughout Taipei. YouBike rental stations were initially located in only the Xinyi district and surrounding areas. This was later expanded to include major transfer stops and areas around MRT stations. Integrating the YouBike service with the MRT, bus, and other public transportation systems has not only met residents' short-distance transportation needs, but also provided a more comprehensive public transportation network.

Smart Garbage Truck Fleet Management Reduces Missed Collections

In Europe, most national governments outsource waste disposal operations. To improve management efficiency, these garbage removal firms have adopted a fleet management system, affixed radio frequency identification (RFID) tags to every garbage can around the city, and equipped each garbage truck with an in-vehicle terminal. During garbage collection round, information stored on the RFID chips can be read by the terminals and recorded in the system. This eliminates the manual transcription process, and prevents drivers from taking trucks to unexpected locations or collecting unauthorized garbage. Additionally, this system can be used to provide the estimated collection time, to ensure that residents do not miss the garbage collection times.

Automatic License Plate Recognition (LPR) in Queensland, Australia, Eases Highway Traffic

To improve traffic flow on highways in Queensland, Australia, the government altered the existing electronic toll collection system, and installed cameras at toll stations interchanges to conduct license plate recognition. The recognition results are then sent to the back-end system to calculate the toll payable for the vehicle for that journey. Invoices are then sent out, or the corresponding amount is deducted from the car owners' prepaid accounts. Accordingly, vehicles passing through toll stations are not required to slow down. The number of vehicles on the road and peak traffic times can also be analyzed to identify driver needs and provide customized route suggestions that enable drivers to avoid congestion and reach their destination quickly.

Guiding Further Upgrades to Rail Transportation

Advantech has years of experience in the intelligent rail transportation market. Different dedicated systems are developed for different applications, which have resulted in many successful cases of application development for rail transportation and railways in China; and Advantech has become the premier brand in the market.

Writer | Liao, Pei-Chun

Interviewee | Pax Chiu, Product Manager, Intelligent Transportation Products Department, Advantech China

The Qinghai-Tibet Railway is seen as an unmissable experience by railway enthusiasts. Many tourists have been drawn to it every year since its opening in 2006, enjoying the magnificent plateau landscape views through the windows. The main operation center, established in Xining, Qinghai Province, is responsible for train dispatch, maintenance and all operations coving the whole railway system. At the operation center, there is a large screen that covers three walls for displaying the total operational status of the whole system in real time. Administrators monitoring the screens can instantly get a detailed overview of the stations, of each train's location, and of any emergency situations or unexpected events as they happen so as to quickly respond and keep the system running smoothly.

At the heart of the Qinghai-Tibet Railway system are Advantech industrial computers. They collect all the information about train locations and frequency, stations, operations, tracks and maintenance, and much more. In fact, Advantech entered the rail transportation industry very early; in addition to the Qinghai-Tibet Railway, it has also completed many successful transportation projects in major cities in China. These include the four major cities of Beijing, Shanghai, Dongguan, and Shenzhen, where Advantech solutions are integrated on almost every route. Several other well-known railway projects include the Datong-Qinhuangdao railway, Beijing-

Shanghai Railway, Beijing-Guangzhou Railway, Beijing-Kowloon Railway, Beijing-Tianjin Railway, Wuhan-Guangzhou Railway, and Dalian Light Rail, also incorporate Advantech intelligent rail transportation solutions.

Pax Chiu, product manager of the Intelligent Transportation Product Department, Advantech Greater China, indicated that industrial computers are applied very widely in rail transportation. This includes equipment in direct contact with passengers, such as the electronic billboards for displaying train information in station halls, automatic ticket vending machines or balance inquiry machines placed against walls, to access platforms, and screen doors on the edges of platforms. Additionally, this also includes systems invisible to passengers, such as video surveillance, environmental monitoring, and disaster prevention alarm monitoring. Advantech intelligent rail transportation solutions can be seen in all of these systems.

Strong developments in transportation provide three categories of application services

Currently Advantech's applications in rail transportation are divided into three categories. The first category is systems related to passenger services inside the station, such as automatic fare collection (AFC) systems, passenger information systems (PIS), and information inquiry systems. Solutions used for these systems include electronic billboards and kiosks, dedicated AFC machines, mini fanless box PCs, and more. The second category is control systems beside the station or track, including power supervisory control and data acquisition (P-SCADA) systems, building automation systems (BAS), fire alarm systems (FAS), integrated monitoring systems, screen doors on the edges of platforms, video surveillance, computer chain systems, communications conversion or management at the front-end of signaling systems. These are likely to use solutions from Advantech's ITA/UNO/EKI product series, and usually use 2U–6U rackmount platforms. The third category is applications for train transportation, including video surveillance and passenger information systems on the train.

Pax further noted that the applications are all different, and require different levels of security, stability, reliability, electromagnetic tolerance, temperature tolerance, and power tolerance. Regarding applications for train transportation, the carriages in a moving train are powered through high voltage cables which results in variable voltage stability. This means that the power protection design has to be strengthened to reduce the risk of unstable power supplies caused by the vibrations of a moving train. Furthermore, shock resistance and temperature tolerance also needs to be sufficiently high.

In addition, the most common problem during the implementation of intelligent rail transportation systems is the renovation of older legacy systems and components. Because hardware has long service life spans, usually it is a long time before any system upgrades take place. A frequently encountered problem during the upgrade process is that the legacy application's systems do not work on the new equipment. Even if they can run, there will be problems from differences in resource allocation, drivers, and operating logic. In addition, the parts, connection ports, and wiring of the new machines are also different, which means the old and new machines cannot be swapped directly. To help customers upgrade more smoothly, not only does Advantech provide hardware customization services to allow all existing lines to be connected directly to new machines, it also provides software development tools to allow old applications to be replaced by software that can be operated on the new machines with only minimum modifications required.

For all parts of the service value chain, products must meet diverse needs

Pax believes that the key to Advantech's success in the rail transportation market lies in the fact that Advantech does not only focus on the interests of direct customers - namely the system integrators; instead, Advantech also provides services for all parts of the entire railway transportation value chain. Regardless of its marketing or planning of products, Advantech examines the key requirements of all value chain members, and tries to meet their needs. Take the Automatic Fare Collection (AFC) system as an example, Advantech's most popular dedicated AFC machine, the ITA-1710, comes with features such as easy installation and maintenance, and ruggedized features. This allows it to satisfy the demands of all members of the value chain, including system integrators, owners, and passengers.

Compared to other competitors, the unique aspect of Advantech's solutions is their ability to satisfy technical performance needs during field operations, so that equipment maintenance becomes easier and the time spent on field operations can be reduced.

Take the gates for entering and exiting MRT stations as an example, a small industrial computer responsible for ticket sensing and signal control is usually installed in the gate. However, the size of the gate machine itself is not large, and so the surface and space for staff to operate are limited. As a result, Advantech's design places all ports on the same side, and plans partitions, e.g. an area for USB or COM ports. Another example is the extraction of CF memory cards, which is generally designed as a small cap on the panel. Only by opening the cap can the CF card be taken out. The gate machine, however, has too little space for engineers to directly open the cap; only through the removal of the entire machine can the CF card be taken out. Therefore, Advantech abandoned the traditional layout, and fixed the CF card directly to the tray; technicians can now loosen the screws directly by hand and the tray can be removed entirely for installation of new CF cards.

With China's strong economic growth, rail transportation construction projects are developing rapidly. Advantech provides long-term experience in solutions based on market requirements, and high-quality services that assist all intelligent rail transportation projects. □

Customized for Highway Requirements, Toll System Reduces Integration Time and Costs
Implementing a Lightweight Traffic Toll System

With the rapid construction and development of China's highways, the demand for Electronic Toll Collection (ETC) / Manual Toll Collection (MTC) toll systems has also increased. Advantech, with extensive experience accumulated over the years, launched the highway transportation embedded computer specially designed to satisfy this market's requirements; it reduces system integration time and cost, as well as making the toll system more convenient and power efficient.

Writer | Liao, Pei-Chun
Interviewee | Nick Wu, Business Development Manager, Intelligent Transportation Sector, Advantech China

Highways are important transport arteries that move both people and goods. To maintain the service quality of highways, many national governments have policies where tolls are collected from motorists on the highways, with some differences in the toll stations and toll mechanisms.

Take Taiwan and China for example, Taiwan's national highways use automatic toll scanners built along the highway, where vehicles are automatically scanned, recorded and fees deducted when they pass through. In the beginning, the toll fee was NTD 40 for every toll station the vehicle passed through, but has since been changed to be based on distance traveled. China calculates the toll charge based on distance traveled, using two methods: manual toll collection, and ETC (Electronic Toll Collection) auto collection. Toll stations are built at the entry and exit points of interchanges, and when vehicles enter the highway via an interchange, the toll booth staff issues a round RFID ticket (or if the vehicle is installed with an auto-sensing tag, then the vehicle is detected automatically). At the exit interchange, the ticket is placed in front of a reader, allowing it to detect and calculate the mileage and fees payable.

Dedicated Embedded Computer Developed for Highway Transportation

When a highway toll fee is calculated based on mileage, the role of computers becomes very important. Nick Wu, Business Development Manager of Intelligent Transportation Sector, Advantech China, said that industrial computers form the core infrastructure of a highway toll system. The RFID tickets let the system record the interchanges the vehicles enter and exit, while industrial computers read ticket information, calculate mileage and collect fees, print receipts, control the crossbars and lights at the entrance and exit interchanges, and record and collect license plate images.

In the past, highway toll systems used the rack-mounted IPC-610, which is bulky and can only be installed outside the toll booth. This was later changed to the wall-mounted IPC-6606/6608, which is smaller and can be placed inside the booth. Today, as the sizes of toll booths are getting smaller, and to follow the trend towards energy saving and carbon reduction, Advantech has once again upgraded its product and is launching a dedicated highway transportation embedded computer,

which better meets market requirements.

The dedicated highway transportation embedded computer possesses five key characteristics. The first characteristic is its fanless industrial design, which reduces the maintenance time required for on-site maintenance personnel. Secondly, its zero-noise design offers a significant improvement in work environment and user experience. Also, the device's ports are all in the same general area, which increases efficiency as maintenance is concentrated on a single side. The third characteristic is the design of the in-built memory, which must go through rigorous screening protocols. This reduces the chances of system failure caused by the memory loosening from impact, and also provides for a wide range of operating temperatures. This means the equipment is not restricted by the environment.

Next, system integration time and cost are reduced. In a highway toll system, an industrial computer needs to handle video capturing, I/O processing (output), crossbar and light control, etc. Hence, it requires at least 8 to 10 serial ports. SI normally requires large amounts of time for integrating equipment and compatibility testing. Now, due to the special design of Advantech's industrial computers, and through their high level of integration, all possible compatibility issues can be fully resolved, thus achieving zero risk and faster project implementation and operation.

The last characteristic, which is also the most important, is its environmentally friendly and low power consumption design. Statistics show that each toll booth that uses an Advantech highway transportation embedded computer saves RMB 20,000 in electricity bills per year, which shows it is not only environmental friendly but also reduces operational cost.

Quick Swaps Make for Solid, Efficient Servicing

For system integrators, highway transportation embedded computers help simplify system integration and increase operational efficiency. As Advantech has already integrated the various components required by system integrators, they do not need to procure parts from different vendors individually; SI technical personnel need only liaise with a single supplier. In addition, the physical size of the embedded system is small, making the ETC/MTC toll system more portable. Wu said that one system integrator, after switching to the dedicated toll system, found it to be very portable and easily opened, which meant that the whole computer could be extracted for maintenance. Also, the system design makes "extracting" easy, for prompt component replacement in the event of system failure or data storage problems.

In addition, China has been actively constructing highways since the 1990s, and has implemented a variety of IT equipment for smart highway development, enabling smoother traffic and safer driving. At present, in addition to the ETC/MTC toll system, IT equipment

is also used on highways for the monitoring of tunnels and bridges, as well as video surveillance. Wu said that the application focus of video surveillance on highways differs from monitoring ordinary roads. Road monitoring focuses on license plate recognition(LPR), while for highways, it focuses on monitoring traffic flow, and detecting traffic accidents.

In line with the highway construction objective set up in the 12th 5-year plan, RMB 6.2 trillion is being invested from 2011 to 2015, to build 32,000 km of national highways, plus about 20 km of 2nd-tier and above roads. The trend toward smart highways is bound to result in vigorous development. Advantech, which first entered the market many years ago, has already built a reputation in the industry. Its success cases include highways such as Zhejiang Expressway, Hanghui Expressway, Jin-Li-Wen Expressway, Zhuyong Expressway, etc.; all adopted Advantech solutions.

Wu believes that, compared to its market competitors, Advantech's strengths lie in quality assurance, low hardware maintenance, and rich construction experience. However, most importantly, Advantech also offers high quality, efficient after sales service. Today, Advantech has 39 offices in China, and more than half have technical personnel. When industrial computers require technical support, the personnel can be on site very quickly. There are over 100 dealers and service centers in the country, and service centers can be found in almost all major counties and cities. Users do not have to worry about maintenance or machine failure, which means they can focus their efforts on maximizing their market opportunities, and become the best choice for smart highways. □

Shanghai Pudong Airport Upgrades FIDS to Provide Stable and Reliable Flight Information

A Flight Information Display System (FIDS) plays an important role in assisting air passengers during boarding. To ensure smooth operations in the face of high passenger and freight volume, Shanghai Pudong International Airport uses an Advantech digital signage system as its FIDS, providing passengers with a stable and reliable information service.

Writer | Liao, Pei-Chun

Interviewee | Nick Wu, Business Development Manager, Intelligent Transportation Sector, Advantech China

Shanghai Pudong International Airport has the highest passenger traffic in China, and the third highest freight volume in the world, with over a thousand flights, and nearly 100,000 people arriving, departing, and transferring per day. With such high passenger and flight volumes, Pudong International Airport put high priority on clear presentation of airport flight information that would allow smooth boarding and transfer.

ARK-DS762 Significantly Increases Management and Maintenance Efficiency

Shanghai Pudong International Airport first entered service in 1999, and to date it has been in operation for 15 years. After a while, the original architectural and spatial designs could no longer meet the demands of increasing passenger and freight volumes. Hence, Shanghai Pudong International Airport initiated a 5-year new terminal expansion and old terminal renovation program, and one of the transformation projects was to improve the flight information display system.

FIDS is a system that uses digital signage to provide passengers with real-time information such as check-in counters, flight information, traffic information, weather, airport announcements, airport services, etc. Today, Pudong International Airport has installed this system at important entrances and exits, check-in counters, connecting passages, connecting points, boarding gates, etc.

At the end of 2013, Shanghai Pudong International Airport installed the Advantech ARK-DS762, a digital signage display system, as an upgrade to the flight information display system in Terminal 1. Nick Wu, Business Development Manager of Intelligent Transportation Sector, Advantech China, said that as Pudong Airport was built according to international airport standards, the expectations for a digital signage system were not limited to mere stability and high equipment specification; the system also had to be aesthetically pleasing, and blend in with the existing airport design.

The Advantech ARK-DS762 digital signage display system uses a 3rd generation Intel® Core™ i7 processor, which not only has high computing power, but also supports three independent HDMI HD displays, and is as compact as a notebook. Most importantly, with the modular design and VESA Mount standard specifications, it can be directly installed behind the display board. Not only does this offer fast and convenient installation, it also simplifies subsequent maintenance, which significantly reduces the system integrators' installation time and manpower costs.

Integrated Background Management System Allows Prompt Remote Repair

In addition, Wu believes that another reason why Pudong International Airport chose Advantech as its partner is due to the ARK-DS762's integrated background management system, known as SUSIAccess for Signage, which provides a complete digital signage solution.

SUSIAccess for Signage provides three major functions: media editing, device management and remote delivery. The media editing function uses an intuitive interface, where content can be "dragged" for editing and scheduling. There is no restriction to the format of the content to be played, and includes television programs, webpages, PDFs, Flash animations, etc. The system also supports marquees in a variety of languages, where the administrator is able to remotely control the content to be played, and also update the content directly to the digital signage via USB.

The ARK-DS762 employs remote KVM to manage and monitor every system. If a system abnormality should occur, an alert is sent to the control room's administrator. The administrator is then able to carry out remote repair instantly, including: remote startup and shutdown, automatic backup, etc. If there is a need for onsite repair, the administrator, with prior knowledge of the situation, can bring along the correct components or tools for repair, eliminating the need to waste time traveling back and forth, and thus increasing equipment management and maintenance efficiency.

Wu said that as digital signage is seen directly by the public, the accuracy of the content is very important, especially for the airport flight information system. If incorrect information were broadcast, it could cause great disorder in the airport. Hence, the ARK-DS762 is integrated with McAfee security solutions, and uses a whitelist management strategy to ensure data security. Unapproved content cannot be broadcast, providing FIDS with optimal data protection.

At the end of 2012, there were already 183 civil airports in China, and the number is expected to rise to 247 by 2020. Also, in the 12TH 5-Year Plan, the adoption of smart airports and ports is listed as one of the major construction projects. It is therefore clear that there is high demand for flight information display systems. The Advantech digital signage display system has high specifications, low failure rate, and offers the best value for money. Advantech also offers comprehensive customer service and many years of implementation experiences. Advantech has been active in the airport flight information display application sector since 2006, and its market share has already reached 88%. Advantech's digital signage displays can be found in many major airline hubs.

For an airport, choosing the Advantech digital signage display system offers more than just hardware. It also includes service and implementation experiences, which effectively reduces the time required for system integration and also reduces the risk of implementation failure, thus providing passengers with a stable and reliable information service. □

Munich Airport Intelligent Transportation Optimizes Fleet Dispatch

In 2013, Germany's Munich Airport implemented Advantech's fleet scheduling system and TREK-550 industrial in-vehicle computer terminals to optimize fleet dispatch operations and resolve passenger shuttle bus scheduling problems.

Writer | Liao, Pei-Chun

Interviewee | Van Lin, Director, Advantech Digital Logistics & Fleet Management Sector

Germany's Munich Airport started operations in 1992, and currently boasts the second highest passenger volume of all airports in Germany. The passenger throughput for Munich Airport is more than 38 million people per year, second only to Frankfurt Airport. However, because of the high aircraft take-off and landing volumes, the number of aircraft parking spots and jet bridges soon became insufficient. Consequently, an additional apron was constructed outside Terminal 1, and shuttle buses were employed to transport passengers to the apron for boarding.

Because of the spike in passenger numbers typically experienced during public holidays, the number of buses shuttling passengers between terminals, boarding gates, and aprons can be insufficient for the passenger volumes. This frequently results in passengers being unable to board a shuttle bus and having to wait for the next bus, or no shuttle buses being available for passengers with eminent boarding times.

To resolve these issues, in 2013, a fleet scheduling system was implemented at Munich Airport, and Advantech's TREK-550 in-vehicle computer terminals were installed in every shuttle bus. The scheduling system is used to establish the optimum route for each shuttle bus every day, and the in-vehicle computers are used to communicate with the control center via radio transmissions, thus significantly increasing vehicle scheduling efficiency.

Implementing TREK-550 for Vehicle Management Optimization

Van Lin, Director of Advantech's Digital Logistics & Fleet Management Sector said that before implementing TREK-550, Munich Airport encountered substantial difficulties with dispatching passenger shuttle buses. This affected the service quality provided, as well as flight takeoffs and landings, which subsequently impacted the overall airport operations. Slow passenger boarding delays flight takeoffs, which extends the time until the aircraft parking bay is clear, thereby preventing incoming aircrafts from parking.

To resolve such problems, most people would consider purchasing supplementary shuttle buses or hiring additional drivers. However, because airport operations must emphasize efficiency and costs, procuring IT equipment to improve vehicle dispatch efficiency is actually the more cost-effective strategy compared to purchasing shuttle buses or hiring drivers.

In the past, the control center was only able to track vehicle locations. The passenger transportation status of the vehicles could not be determined because the old system was only equipped with GPS. In the event that a shuttle was dispatched in an emergency, the control center personnel had to rely on handheld transceivers to communicate with drivers. Currently, since the implementation of TREK-550, airport staff can communicate using information technology, which not only saves time, but also increases efficiency and optimizes vehicle scheduling management.

In addition, because TREK-550 supports dual monitor displays, one monitor can be installed in the shuttle buses in front of the driver, and used to display the planned route and target terminal arrival times. Meanwhile, the other monitor can be installed in the passenger waiting area for displaying flight information. This satisfies the information requirements of both drivers and passengers. Lin stated that this feature was one of the reasons why Advantech products were

selected for Munich Airport. The other two reasons were as follows: First, high product reliability and quality; and second, Advantech has service centers all over the world and can replicate the system implementation at other airports.

Advantech's Extensive In-Vehicle Product Lines Enable Intelligent Airport Transportation

Besides passenger shuttle buses, airports also feature other types of transport vehicles, such as fuel and water trucks, baggage trucks, and forklifts. These airport vehicles are only operated following the receipt of dispatch orders from the control center, and their applications differ.

Lin asserted that the emphasis for fuel and water trucks is dispatch efficiency. Considering the high volume of flights and limited aircraft parking time, fuel and water truck-related tasks must be completed quickly. Therefore, the fleet dispatch logic must be clear to ensure optimal management, which includes scheduling flight arrival times, tarmac assignments, and a sufficient number of refueling vehicles. These factors must be considered when scheduling because large aircrafts may require two or three fuel and water refueling trucks, but only one truck can service a plane at a time. Therefore, the second and third trucks should only be dispatched after the first truck has completed its refueling operations, rather than waiting by the side of the plane until the first truck to finish. Hence, dispatching information is extremely important. The purpose of baggage trucks is similar to that of fuel and water trucks, except that baggage trucks also feature a barcode reader to ensure that passenger luggage is transported accurately.

Warehouse forklift trucks are typically equipped with radio frequency identification (RFID) technology for accurate baggage handling. Storage racks are also equipped with RFID tags, and the forklift in-vehicle computers are integrated with RFID readers. Thus, when collecting and delivering baggage, drivers can use the RFID reader to scan RFID tags to ensure the correct cargo is retrieved. After baggage is correctly identified, the system informs the driver of the destination aircraft and its location.

The various applications and vehicle types result in differing requirements for in-vehicle computers. For example, because baggage trucks are typically roofless, the in-vehicle computer must be waterproof and equipped with a sunlight readable monitor. Lin emphasized that Advantech's comprehensive range of in-vehicle computers feature a wide operating temperature, stable power, wireless communication (supports Wi-Fi, 3G, and 4G LTE), and GPS to satisfy various airport fleet management requirements and facilitate the establishment of intelligent airports based on transportation fleet information. □

Advancing Vessel Monitoring Systems to the Next Level

Advantech's automation solutions are not only stable, flexible, and cost effective, but also adopt redundant designs for marine applications. These solutions form the core of SaierNico's vessel automation monitoring system, which is currently employed in more than 200 ships worldwide.

Writer I Liao, Pei-Chun

Interviewee I Zhang Bang-Cai, General Manager, Emerging Business Group, Advantech China

On a clear and hot June summer day, the Guang-Ming set sail through calm blue seas towards its destination. Captain David, having inspected the entire vessel, was sitting in the mess hall enjoying his lunch. Suddenly, an alarm went off. He looked at the monitor on the wall and saw warning lights at the location of the bilge valve, indicating a potential problem with the valve's remote control system. David dropped his lunch, jumped up from the chair, and rushed to the captain's cabin. Using the shipboard broadcast system, he instructed the chief engineer to check on the valves. For vessels similar to the Guang-Ming, having SaierNico's Alarm and Monitoring System (AMS) installed is crucial because crew members are not relied on to verbally report problems with the onboard systems.

To ensure vessel safety and reduce human error, ships worldwide are increasingly adopting fast, specialized, intelligent systems, as evidenced by the recent trends in intelligent vessel management and vessel management companies' increased monitoring, managing, and emergency response capabilities. Ultimately, such measures better ensure the safety of traveling ships. Established in 1994, SaierNico Electric & Automation Ltd. developed the Integrated Automation System (IAS) in 2011. This system is currently employed in more than 200 ships, including bulk freighters, tankers, container ships, ocean engineering vessels, and offshore transfer/loading platforms.

Using Advantech's Automation Solutions at the Core

SaierNico's IAS comprises not only the AMS mentioned above, but also onboard subsystems such as a valve remote control system (VCS), vessel management system (VMS), vessel-integrated computer network system, vessel digital maintenance management system, external fire-fighting system, and video surveillance system (CCTV). Each of these subsystems features Advantech's automation solution as its core infrastructure.

Advantech is an important partner of SaierNico. Zhang Bang-Cai, General Manager of the Emerging Business Group, Advantech China, explained that IAS collects data from various onboard subsystems and monitors for abnormalities. When vessels are out at sea, malfunctioning subsystems that are not immediately repaired pose significant safety risks to the people onboard. Additionally, considering the harsh weather conditions, such as heat, shock, humidity, and salt fog, encountered at sea, the IAS plays an important role in mitigating potential safety risks.

SaierNico selected Advantech's automated solutions because of their overall flexibility and stability. The products currently used by SaierNico include Advantech's human machine interfaces (HMI), industrial control systems, configuration software (WebAccess), ring switches, programmable automation controllers (PAC), and I/O modules.

Specifically Designed for Marine Applications to Enable Flexible Management

Zhang Bang-Cai reported that SaierNico trusts Advantech because of its high product and service quality. However, Advantech products also offer two

additional advantages: flexible PAC programming, and strong functionality. Furthermore, Advantech systems are designed according to the requirements of marine applications.

In the past, the system architecture of vessel automation monitoring systems was typically based on adopted programmable logic controllers (PLC). When used as the core controller in industrial automated equipment, PLCs offer high operational stability. However, their disadvantage is the complex programming required, which effectively hinders the development of new applications. This restricts the functional expandability of automated control systems, both in terms of budget and technology. Advantech's PACs are based on PC technology, which equips them with functionalities similar to those of a PLC, yet retain the characteristics of flexible programming, reasonable pricing, stable operations, and adaptable systems. For example, the serial ports of automated control equipment specify the standard communication protocol to employ, enabling engineers to easily write the protocol into the PAC program. By contrast, a PLC is difficult to program, and users are often required to purchase appropriate protocols.

Advantech recognizes that rough journeys can disconnect communication cables, potentially causing irreparable damage to the equipment and systems; thus, redundant systems have been integrated into the design. For example, two RJ45 communication ports and spare serial communication cables are provided for backup use. Although the configuration software also features redundant designs, the EKI switch must adhere to a ring design to ensure normal operation of vessels when at sea.

Zhang Bang-Cai asserts that besides displaying all vessel data on the console via the HMI, the most important characteristics of this vessel monitoring system is its unique AMS design. This involves installing a WebOP-

programmable HMI in all frequented areas (for example, the ship mess hall) to serve as extensions of the alarm board.

Because most onboard systems can be automated, only 17 to 18 crew members are typically required to effectively operate a vessel. When the extended alarm board displays an alert message, the system records the time and location where the confirm button is first pressed. Therefore, this system can also be integrated with the vessel management system; for example, when an alert message is displayed, a timer begins counting down the time allocated for pressing the confirm button, which encourages all crew to attend to the situation as soon as possible.

Regarding system integration, the vessel type is one factor that determines the difficulty of system integration. Consider a bulk freighter with the primary purpose of transporting goods as an example. Although large, such vessels are not equipped with much machinery or equipment; thus, system integration is simpler. However, certain vessels such as ocean engineering vessels and oil spill recovery vessels are equipped with a high amount of onboard equipment despite their relatively small size. This equipment complicates system integration and increases the demands for automated control systems.

The partnership between SaierNico and Advantech started with the development of AMS. The scope of their collaborative development has since been expanded to vessel IASs in an effort to integrate multiple onboard subsystems into a single networked monitoring platform. In the future, remote transmission technology will be incorporated to allow data uploads to a cloud when vessels are docked. The vessel owner and engineers can then access this data via the Internet to obtain real-time status updates. ☐

Application Story

Digital Healthcare

▸ Intelligent Outpatient Services

▸ Quality Nursing Care

▸ Integrated Operation Rooms
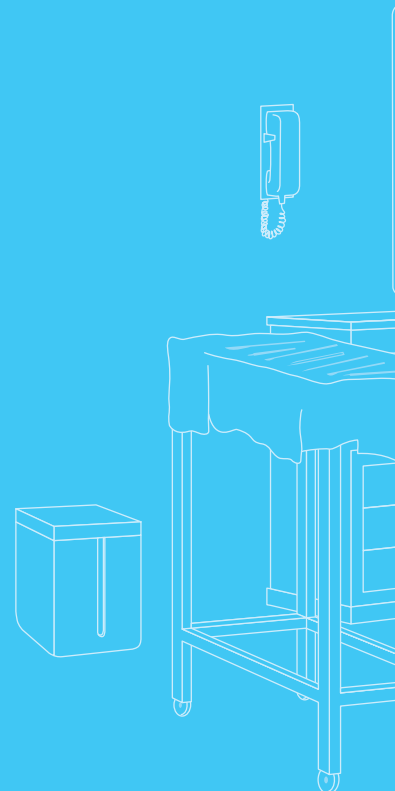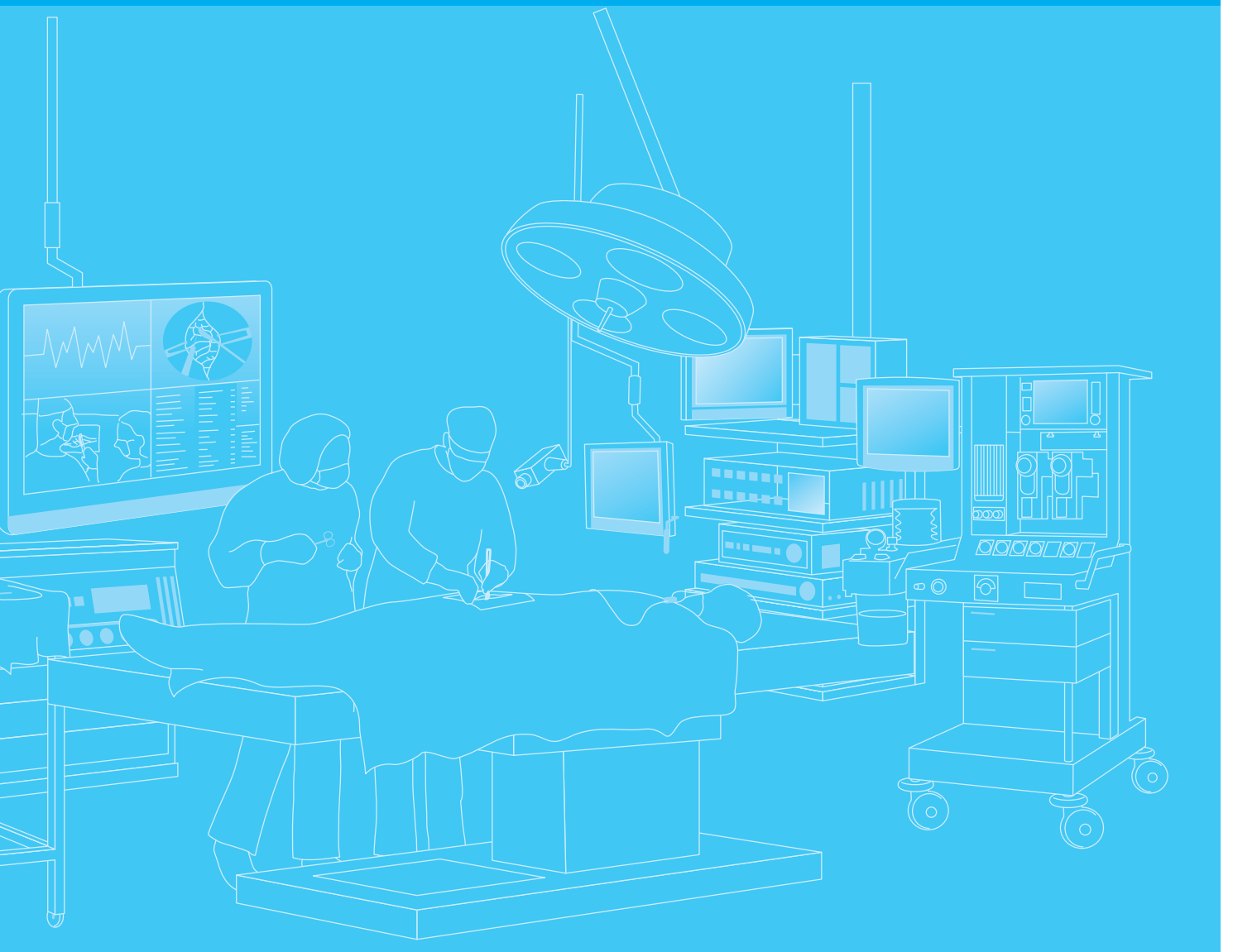
Welcoming the Digital Healthcare Treatment Era

With the vast amount of information and digital technologies available, not only has the standard of medical services improved, but such applications have also given rise to a new intelligent era, where a higher quality of medical services are provided.

Writer I Liao, Pei-Chun
Interviewee I David Lin, Director, Advantech Digital Healthcare Division

Recently, at the Mobile World Congress in Barcelona, Samsung introduced a new smartphone equipped with fingerprint recognition technology, a built-in heart rate monitor, as well as other healthcare application functions. Coincidentally, Apple is also attempting to create medical hardware products in an effort to establish itself in the smart medical treatment field.

With these technology giants recently entering the digital healthcare treatment field, David Lin, director of Advantech's Digital Healthcare Division, believes that the focus of the technology industry is gradually changing. The following three factors have generated changes to traditional care models: healthcare personnel shortages, increasingly high proportions of national GDP spent on medical care for aging populations, and increasingly advanced semiconductor technology. The newly emerged point-of-care (immediate care) healthcare model further integrates information technology with medical care, facilitating the rapid integration of smart medical healthcare into everyday life and the provision of a higher standard of service.

Aging Populations and New Technologies Accelerate the Evolution of Medicine

Regarding the "aging population" mentioned by Lin, because of the maturation of post-war baby boomers in the last half a century combined with declining birth rates, the proportion of the population classified as elderly has gradually increased. Statistics provided by the United Nations Population Fund indicate that the number of people aged over 60 worldwide reached 810 million in 2012, accounting for 11% of the world's total population. This number is estimated to reach 2.03 billion by 2050, which would account for 22% of the world's total population. The proportion of GDP spent on medical care has also risen annually, which suggests that in the future, governments may face exorbitant healthcare costs. In addition, semiconductor technology has progressed, and processor prices have declined although functionality has gradually improved. The combination of these factors has resulted in improved medical equipment functionality, with their reciprocal influence leading to the establishment of the point-of-care healthcare model.

Under the new care model, information and digital technologies are applied to not only improve service quality, but also shape a new outlook for digital healthcare. For example, RFID tags and temperature sensors can be applied to blood storage bags. Temperature sensors ensure a constant temperature when blood supplies are transferred from storage for use, and RFID tags can be used to record relevant production history data for the blood bag, such as donor information, blood type, and the existence of infectious diseases, which reduces the possibility of medical mishaps.

IBM once proposed the ideal blueprint for digital healthcare devices. When a patient enters the hospital, medical personnel tag the patient (with either a barcode or RFID), to ensure that they are always aware of the patient's whereabouts. When the patient receives treatment services, healthcare workers can use computers to obtain an overview of the available resources, such as required medical devices, medicines, and materials, and their locations. The patients, doctors, nurses, medical equipment, and all relevant medical data are linked together. In addition to providing the ideal model of smart medical care, the proposed blueprint fits the concept of the Internet of Things (IoT), where all information is integrated into a single platform.

Digital Healthcare
Engaged with Smarter Hospitals

Intelligent Diagnosis　　**Quality Healthcare**　　**Digital Integrated Operation Room**

The Three Phases of Digital Healthcare: Digital, Mobile, and Remote

Lin indicated that digital healthcare emphasizes the provision of patient-centric medical services with the following three objectives: (1) to provide patients with superior care, (2) to reduce medical costs, and (3) to improve medical services and prevent treatment errors such as incorrect medication prescriptions. In other words, patients receiving care can enjoy greater freedom and would not be required to reside in a hospital for treatment; furthermore, a single caregiver (or medical care personnel) can care for a greater number of patients.

What can we do to transition from traditional medical services to smart services? David believes that we must progress sequentially from digitalization to mobilization, in order to achieve the goal of remote patient care. The aim of the first step – digitization - is to reduce costs by integrating electronic medical records (EMRs), picture archiving and communication systems (PACS), clinical information systems (CIS), etc. The second step is to enhance mobilization to increase the freedom enjoyed by both patients and caregivers through the integration of computerized physician order entries (CPOE), real-time location systems (RTLS), etc. The final step is remote care, where medical care services, such as treatments or monitoring devices, can be delivered remotely in a broad range of areas.

Considering the current status of global smart medical care developments in terms of the three phases, digitalization and mobilization technologies are already quite mature in the United States. The United States is also currently developing remote care applications. Numerous European countries have already undergone the digitization phase. Mobilization and remote care have begun to be implemented in Western European countries, gradually spreading to other European countries concentrically. China has also exhibited substantial growth with third-tier hospitals achieving moderate digitalization and tertiary AAA-level hospitals developing mobile care technologies, such as integrated mobile medical treatment carts. However, primary and secondary-grade hospitals in China still remain in the digitalization phase.

To assist and promote digital healthcare applications in the Greater China region, Advantech has developed healthcare solutions that include intelligent outpatient services, quality nursing care, and integrated operating room to incorporate various application scenarios into hospital reception counter, nursing station, ward, and operating room equipment, and create friendly healthcare environments.

Lin emphasized that digital healthcare necessitates effective computer platforms and the IoT. Advantech's digital healthcare devices are specifically designed for healthcare environments and have passed IEC60601-1, EN60601-1, and UL60601-1 safety certifications. These devices can be used by physicians as well as nursing staff to access a variety of clinical information. In the last decade, Advantech's digital healthcare devices have been adopted for many long-term operations and applications throughout the Greater China region. In the future, Advantech plans to reference the integration and management experiences of Taiwan's hospitals to assist hospitals in China with implementing smart facilities, controlling costs, improving healthcare standards, and providing superior quality medical services. ☐

Information Systems with Mobile Phone Inquiry Capabilities Increase the Efficiency of Patients Reporting for Treatments

Advantech's Intelligent Clinic Check-in System – Eliminating Medical Treatment Queues

We have entered an era of emphasis on medical service quality. The combination of computerized automated treatment schedules and health education advocacy information, as well as the ability to check patients' treatment progress via a mobile phone app can effectively improve the efficiency and convenience of medical services while reducing patients' waiting time.

Writer | Liao, Pei-Chun
Interviewee | Marco Lin, Sales Manager, Advantech Intelligent Services

Waiting is a common experience for most people when visiting a hospital. In today's society, where service quality is emphasized, to enhance the efficiency and convenience of hospital visits and reduce patients' waiting times, an increasing number of hospitals are replacing traditional paper signs with intelligent clinic check-in systems and integrated mobile phone apps. This enhances the convenience of checking patients' treatment progress. The Bei-Hu Branch of the National Taiwan University Hospital is an example of one such hospital.

Connecting the Front-End and Back-End to Reduce Waiting Periods

In 2013, the National Taiwan University Hospital, Bei-Hu Branch, incorporated Advantech's intelligent clinic check-in system and installed multimedia signage outside of outpatient clinic rooms. These signages can be used to display relevant information such as the date, outpatient clinic departments and categories, attending physicians and nurses, number of the patient currently being seen, as well as the number of the next patient to be seen. Patient numbers are presented in large font. Such signages provide patients with all necessary information related to their wait, and can be used to display hospital notices, health education information, etc.

A back-end treatment schedule management system is available for clinical nursing staff to use in conjunction

with front-end hardware monitors. Marco Lin, Sales Manager of Advantech Intelligent Services, indicated that before beginning outpatient treatments, attending nurses at the National Taiwan University Hospital, Bei-Hu Branch, can log into the outpatient computer, obtain the treatment waiting list from the Health Information System (HIS), and establish patient waiting list rules. The system then displays the patient waiting list on the multimedia signage outside the outpatient clinic room. When a patient's treatment consultation has ended, the nurse is only required to click on the next patient for the signage outside the outpatient clinic room to display the number of the next patient. Audio announcements reminding the next patient to report to the correct room can also be made using the system. Patients who have already been seen are automatically removed from the patient waiting list, enabling outpatient healthcare personnel to remain up to date regarding the status of treatment consultations.

To further enhance outpatient treatment efficiency, the top and bottom of the intelligent check-in system are equipped with speakers and IC card readers. Patients must insert their National Health Insurance (NHI) cards to complete the registration procedure, which allows the system to add them to the treatment waiting line based on the previously configured waiting list rules.

Lin indicated that no specific hardware specifications exist, and the hardware types are selected according to the hospital's treatment process. For example, in hospitals in China, attending nurses are not assigned to outpatient clinic rooms, and the registration, reporting, and payment procedures are integrated. Therefore, the intelligent check-in system must also feature two buttons for "Yes" and "No." When patients report to a clinic and insert their NHI card, the system queries whether they want to register and make a payment. The patient registration and reporting procedure is only completed if the "Yes" key is pressed in response to both questions.

For the National Taiwan University Hospital, Bei-Hu Branch, incorporating the intelligent clinic check-in systems provides the following four benefits:
1. Protects patients' privacy because reporting patients no longer need to enter the clinic room to register.
2. Reduces the workload of attending nurses.
3. Eliminates patient disputes with nurses regarding any perceived unfairness with the waiting list.
4. Increases the accuracy of treatment information. Online checks of patient's treatment consultation progress are traditionally conducted using HIS data. However, because nurses are responsible for calling the number of the next patient to be seen, there may be errors or delays occur. Currently, the treatment consultation progress management system is integrated to increase the accuracy of waiting line inquiry results.

High Flexibility Satisfies Various Demands

Numerous hospitals in Taiwan have incorporated Advantech's intelligent clinic check-in solution to improve service quality. These hospitals include the Taipei Veterans General Hospital, Linkou Chang Gung Memorial Hospital, Tri-Service General Hospital Songshan Branch, Sin-Lau Hospital, Landseed Hospital, Toufen Wei Gong Memorial Hospital, and Miaoli Da Chien Hospital. Lin asserts that these hospitals selected Advantech for two reasons. The first was that they required a solution with integrated software and hardware. The second reason was that Advantech's system is highly flexible, especially regarding the patient number calling rules and signage content design; only Advantech offers consumers customized services.

Marco also highlighted that the patient order number rule could vary between hospitals and departments. For example, some hospitals might provide preferential treatment to the elderly and prioritize patients aged over 80. In such cases, patient registration numbers are for reference only. Regarding patients who check-in late, the rule is that late patients can only be seen after 2 to 5 patients in the regular waiting line have completed their treatment consultations. The system's patient number calling design must be sufficiently flexible to enable medical staff to enter different parameters in response to diverse needs.

The check-in system's flexibility is further demonstrated in the user interface designed for clinics. The system offers a few fixed versions that hospitals can modify while also determining the content to be displayed. For example, the clinic can determine what content to display in the space below the treatment consultation number based on the number of patients. If the number of patients exceeds 100, a patient list is appropriate. If the number of patients ranges between 10 and 20, then health education information or a combination of the patient list, bulletin board, and physician profiles can be displayed in rotation.

Considering the popularity of smartphones, Advantech's intelligent clinic check-in solution also allows patients to use a smartphone app to make reservations/inquiries, cancel registration, tour hospital facilities, obtain health education information, receive immediate notifications when next in line for a treatment consultation, and check the progress of treatment consultations. In the future, smartphone apps are expected to serve as information distributors, with hospital-related treatment information transmitted to patients' smartphones. For example, smartphone apps can notify patients of the current consultation appointment number, precautionary information, and/or public bulletin messages. This ensures full communication between patients and hospitals, thereby enhancing the quality and efficiency of medical services provided.□

From Registration to the Dispensary, Upgrades for Internal and External Efficiency

Digital Calling and Queuing System at Hospital Counter Services Eliminate Wasted Time

Hospitals can effectively improve service efficiency and quality and reduce patient waiting times by using multimedia signage and self-service kiosks appropriately in public spaces and counter areas.

Writer | Liao, Pei-Chun

Interviewee | Marco Lin, Sales Manager, Advantech Intelligent Services

It is time for another change of seasons. The hot and cold weather has aggravated Mrs. Chen's cough again. Jerry, Mrs. Chen's eldest son, took a day off just to bring Mrs. Chen to the hospital for a detailed checkup. At the hospital, Jerry only needed to pull a registration number slip from the self-service kiosk at the second floor entrance, after which, he was free to go to the first basement floor with his mother to eat breakfast. Mrs. Chen nervously asked Jerry, "Son, we don't have to wait on the second floor? What if our number is called?" Jerry pointed at the screen up front and smiled, "Don't worry, mom, the number will show up on the screen there. We can just return to the examination area when it's our turn!"

The Advantech Digital Calling and Queuing System contains public area broadcasting televisions or signage, self-service kiosks, and counter information systems such as this offer flexibility to patients while they are waiting for treatment. Such systems are becoming increasingly prevalent in major hospitals in Taiwan. Marco Lin, Sales Manager of Advantech Intelligent

Services, indicated that as long as the flexibly-sized multimedia signage and kiosks are available in public spaces and counter areas, hospitals can effectively improve service efficiency and quality, reduce the patients' waiting time in hospitals, and allow patients to move about freely in the hospital to pass the time while waiting instead of having to sit at one place.

Take the utilization of public spaces as an example. Self-service kiosks are similar to information centers, enabling patients to submit inquiries regarding any required information themselves. In addition to broadcasting television news, health education information, major hospital announcements, and public promotions, multimedia signage can also be used to collect and display outpatient patient numbers and counter patient numbers. For example, the Linkou Chang Gung Memorial Hospital has installed televisions on top of the inpatient services counters to broadcast television news as well as the number of people waiting for hospital beds in each department. The Taipei Veterans General Hospital has installed signage above

elevator doors, to display the treatment consultation progress for the various outpatient departments. The contents of the Tri-Service General Hospital multimedia signage include television news, treatment consultation progress for the various outpatient departments, and the progress of various counters.

Marco indicated that Advantech provides highly flexible choices regardless of the location of the multimedia signage, thus enabling users to configure the layout and manage the channel content and playback scheduling according to their needs. Generally, the hospitals' IT department is responsible for maintaining the functions of the signages. The head nurse is responsible for the content maintenance and operation. However, because nurses are not IT specialists, the control interface cannot be too complicated. The Advantech multimedia signage management uses a drag-and-drop interface for data configuration, thus making it convenient for nurses to lay out the contents.

Self-service Reduce Patient Waiting Period by 90%

The applications of multimedia signage for the counter areas are similar to those in public spaces. However, the displayed content will primarily be based on the patient numbers for treatment consultation. In addition, self-service kiosks are installed at the counter entry points, for visitors to obtain number slips. In addition to the LED displays atop each counter that show the patient number currently being processed for that counter, interactive touch computers can also be placed on platforms facing the customers, displaying the service provider's name, welcoming messages (such as "we welcome your visit"), billing amounts, health education advocacy, etc. Customer satisfaction surveys or questionnaires can also be offered here.

Marco further noted that hospital counters are generally divided into 5 types: billing and registration, examination, radiology, medicine dispensary, and discharge. The Advantech medical grade touch computers can display messages based on the service contents of each counter. For example, devices at the examination counter can remind patients of important precautions, devices at the medicine dispensary counter can display medicine confirmation images, and devices at the billing and registration counters can be used to confirm the billing amount or perform satisfaction surveys.

The biggest benefits of this approach are improved operational efficiency and reduced waiting periods. Take the National Taiwan University Hospital's examination counters for example, after the hospital switched to the digital calling and queuing system for registration, patients take the examination form to the self-service kiosks to swipe the barcode, and then the screen on the self-service kiosk displays the precautionary notes (such as: you must wait until 20 minutes after a meal before you can draw blood). The machine also notifies the patient of his/her number,

and the number of the counter that the patient should report to. According to the internal statistics from the National Taiwan University Hospital, the original manual reporting system would require patients to wait for approximately 60 minutes, but the average waiting period was reduced to 30 seconds after the introduction of this innovative service.

Of course, in addition to reducing waiting periods, the Digital calling and queuing system - also can improve internal management efficiency. Marco indicated that the counter information system would generate performance reports according to the business type/counter type/week/month. Therefore, supervisors can see the processing time for each counter, the time required for each counter staff member to service one patient, and the average number of patients that a counter staff member can service per day. If it is discovered that the processing time required for any given patient is too long, supervisors can also go to the site directly to address the issue. Previously there was a great deal of public concern over the issue of overworked hospital personnel, and the reports generated can also be used to find out the causes of such problems.

Tailor-made for Clinics:
PowerQ digital queuing System

The aforementioned applications are primarily found in mid- to large-sized hospitals. Smaller clinics can use the PowerQ solution tailor-made for clinics by Advantech. Marco indicated that clinics mostly have less staff, composed mainly of doctors and nurses without any IT personnel. Therefore, digital technology solutions must be simplified enough to achieve widespread use. To this end, Advantech simplify the original calling and queuing system by integrating the waiting area public broadcasting digital screen, treatment consultation information billboard, and smartphone app into the PowerQ solution.

PowerQ already has several default templates for multimedia broadcasting system and clinical display Clinic staffs only need to input the physician's schedule (e.g., the department and doctor available on Monday morning), the physician's profile, and the health education advocacy information.

The smartphone app provides patient queuing notification services, where people only need to enter their appointment number and how many numbers ahead that they would like to be notified of in advance, and the system would provide automatic notifications based on this setting . For clinics, this approach can improve the quality of services, resolve problems related to waiting periods, thus enhancing patient retention and reduce the risks of infection due to too many patients gathered in the waiting room simultaneously. Advantech's innovative products and services can reduce the patient waiting periods in hospitals and improve service quality. □

Enabling Faster, Better Patient Services

In sync with digital health care trends, the Affiliated Hospital of Qingdao University began using the Advantech AMiS-50 Medical carts in 2013. These mobile workstations help medical staff provide higher quality patient care.

Writer | Liao, Pei-Chun

Interviewee | Eugene Lin, Business Development Manager , Digital Healthcare Sector, Advantech China;
Zhi-Hui Wang, Product Manager, Digital Healthcare Sector, Advantech China

Improving the efficiency and quality of healthcare services has been a major global trend in recent years, and is also a goal in China. An increasing number of hospitals there are migrating towards more intelligent solutions, introducing electronic medical management systems and using digital technology to provide high-quality nursing care. The Affiliated Hospital of Qingdao University is one such hospital.

Mobile Medical Carts Take Service to the Bedside

The Affiliated Hospital of Qingdao University was founded in 1898. It is the largest comprehensive teaching hospital in Qingdao City, and also serves as the regional medical center for eastern Shandong Province.
At present, it has three branches, with a total of 2640 hospital beds. In accordance with modern trends toward digital healthcare, the Affiliated Hospital of Qingdao University decided to introduce digitized medical care equipment. To this end, they began using the Advantech AMiS-50 Medical Carts in 2013, allowing medical personnel to provide higher quality medical treatment services to patients. At present, the hospital has a total of 450 medical carts, with 300 of them used by nurses and 150 of them used by resident physicians.

Eugene Lin, Advantech Digital Health Business Development Manager in China, indicated that the Affiliated Hospital of Qingdao University has adopted the AMiS-50 as mobile workstations for healthcare personnel. When carrying out healthcare activities, nurses can access medical information via the hospital information system (HIS) and drug administration software on AMiS medical carts, thus ensuring drug administration safety. Nurses are also able to directly record the patients' physiological information (temperature, blood pressure, etc.) without needing to return to the nursing station to reenter the data. This naturally reduces the need to go back and forth between the ward and the nursing station, and more time can be spent on observing patients' physical conditions and responding to their needs. As care improves in the wards, patient satisfaction levels increase accordingly.

When resident physicians are making their rounds, they can the medical carts to issue medical instructions, access information, or explain medical information to patients. The attending physicians can also use the carts as clinical teaching tools. Lin indicated that some hospitals are presently using tablets to replace the medical carts for physicians as they make their rounds. The iPad is the most commonly used device. While it is convenient to use a tablet, there are also hidden risks. First, tablet PCs in general are commercial electronic products, and there will inevitably be concerns about application security and stability. In addition, numerous medical treatments require both hands. Under these circumstances, where would a doctor place the tablet?

AMiS-50 is Stable and Safe, Designed Specifically for Medical Applications

In contrast, the AMiS-50 is developed specifically for medical applications. The AMiS-50 has no issues related to stability, quality, or safety, and complies with the IEC60601-1, EN6060, EN6060-1, and UL60601-1

electrical medical equipment safety standards. Zhi-Hui Wang, Advantech Digital Health Product Manager, indicated that the AMiS-50 is based on existing Advantech motherboards, and its computer has an ergonomic design. It is small, dissipates heat rapidly, fanless, and its seamless design allows it to be dust-free. This makes it easy to prevent contamination by infectious agents. Advantech also provides an intelligent management platform that can simultaneously monitor 255 medical carts, which can effectively reduce management costs.

However, the Affiliated Hospital of Qingdao University encountered two temporary problems when they introduced the medical carts. The first problem was with the wireless AP switching. Under normal operating conditions, the mobile medical carts automatically switch to the strongest nearby wireless AP to ensure a constant Internet connection. However, if wireless APs locations are not ideal, then the automatic switching mechanism may fail. This sometimes resulted in carts being unable to properly connect to the Internet when they were pushed into certain dead zones. Therefore, rigorous tests and adjustments were conducted during the actual introduction of the carts to prevent situations that might lead to Internet connection failure. The second minor problem was nursing accessory customization. The AMiS-50's medicine box accessory, which is usually 1U in height, was modified into a 2U drawer designed with an IV drip rack, to accommodate Qingdao Hospital's requirement that the cart must have an IV drip rack.

Wang stressed that Advantech had conducted in-depth market research before the development of its

intelligent medical solutions, and has a firm grasp of the market's demands through feedback from dealers, personal end user visits conducted by salespersons, and academic-industry collaborations. Therefore, there are significant differences between the AMiS-50 and its competitors, the most significant of which are overall cart technology and the battery. In terms of the battery technology, over 80% of carts on the market use lead-acid batteries. Thanks to the heavy batteries, these carts weigh in at around 15 kg total, and the batteries have a maximum lifespan of only about six months. Advantech's AMiS-50 uses lithium iron phosphate batteries, which helps keep cart weight down to a trim 8 kg, due to the reduced weight of the battery itself. The AMiS-50 is around half the weight of traditional carts, with a battery that lasts 8 to 10 hours between recharges.

In addition, no other vendor has Advantech's comprehensive computer-to-cart technology; other medical cart systems may have computers, carts, and components each purchased from different manufacturers. Advantech has developed its cart from the ground up. The computer and the body of the cart itself are all designed, manufactured, and integrated by Advantech. This results in fewer integration issues, and maintenance is also fast and convenient. If a user encounters any problem, they need only to find an Advantech service station to obtain a solution. Lin further pointed out that there are currently 63 Advantech service stations throughout China, which means every province gets direct service. And Advantech's service quality and efficiency are all above the usual standard. Finally, because each hospital and clinical department has distinct needs for its medical cart, Advantech easily modifies the healthcare accessories of the AMiS-50 with modular designs, in order to satisfy the varying demands of different healthcare providers.

Advantech has been active in the digital healthcare field for many years, and has the advantage of ample experience that gives a deep understanding of user needs. Advantech is proud to have been chosen to provide medical carts for the Affiliated Hospital of Qingdao University, and looks forward to partnering with other hospitals seeking to create high quality healthcare services. □

Medical carts are often the first things that come to mind during discussions of mobile medical care. Howard Hsiung, Business Development Manager , Advantech Digital Healthcare Sector, believes that medical carts should have comprehensive features. In addition to a computer, numerous other medical and nursing accessories can be integrated into mobile carts, such as a blood pressure meter, medicine server, or cotton swab dispenser. These are all equipment that may be used by nurses when they make their rounds or administer drugs. However, not every accessory is required during every round. Sometimes, nurses only want to know if the patients' conditions are stable or confirm what the patients may need. Under these circumstances, a lightweight portable tablet is more convenient and practical than an entire cart.

The tablet mentioned here is not a commercial tablet such as an iPad. Instead, it is a clinical tablet developed specifically for the requirements of medical care. Advantech's clinical handheld device, the Pocket Pad, is designed specifically for patient care. The Pocket Pad is a 7 inch tablet that runs the Windows 8.1 operating system, and comes with devices such as barcode scanner, NFC, and GPS. It weighs only 400 grams. The Pocket Pad's IP54 dustproof and waterproof design allows nurses to clean it by wiping it with alcohol which helps strengthen infection control. It is 90 cm drop resistant, helping protect the product during the busy nursing care process.

Commercial Tablets have Numerous Problems

Howard indicated that some hospitals have introduced iPads into the medical environment, allowing doctors to carry an iPad as they make their rounds. Doctors can use the iPad to explain each patients' condition to them, or check medical records. While this may be convenient, people seem to ignore the fact that commercial products are not designed to fulfill the requirements of the medical sector, and commercial products are prone to a variety of problems. Among them, the most critical problems are operating system compatibility and stability.

Because numerous hospital information systems are built on Microsoft platforms, it is preferable for mobile tablets to run on the Windows operating system in order to ensure the smooth operation of all the healthcare information systems. However, the most commonly seen commercial tablet PCs in the market today mostly run on the iOS or Android operating systems, so actual operations with these devices are not as smooth as expected.

Frank Huang, Manager, Advantech Digital Healthcare Sector, further indicated that commercial devices may have three problems. The first is the problem of size. Commercial tablet might not be able to fit into the pocket of a physician's robe. If a physician must use two hands to examine a patient, then finding a place to put the tablet may become a major problem.

The second problem is data transfer. If you want to operate applications

developed under a Microsoft platform on an iOS or Android device, information must be exchanged through middleware. If the middleware is not well designed, problems such as data loss or garbled data would occur during data transfer. In addition to the development of the middleware, the issues of its maintenance and upgrade must also be considered. Even if the application is modified into a web-based version (i.e., an online application program), format layout errors would still occur if different built-in browsers are used.

Frank indicated that the Pocket Pad uses Windows 8.1 as its operating system, and not the Windows CE or Mobile versions commonly adopted by mobile devices. Windows CE appears to have more compatibility problems for RISK support, and Microsoft has stopped support for Windows Mobile. Although the Windows 8.1 user interface is not very user friendly, it is worth noting that the Pocket Pad is a professional device, which means only a few specific applications are actually used on the Pocket Pad, thus making it more convenient to learn and use.

Finally, commercial tablet PCs' protection mechanisms are not robust enough. If you drop them, they could easily break. Some hospitals in Australia issued iPads for doctors to use while making their rounds, but found that the malfunction rates for the iPads were too high. The hospital's internal investigation discovered that within three months, each doctor had broken 2 to 3 iPads. Therefore, although commercial tablet has lower prices, the costs of incorporating them are not necessarily lower because hospitals must prepare numerous backups in the event that the iPads are damaged or broken.

Pocket Pad is Developed Specifically for the Medical Environment

In contrast, the Pocket Pad not only passes the 90 cm drop resistance test, it has IP54 ingress protection against dust and water, and its body is made using antibacterial materials. The Pocket Pad can be wiped with alcohol, is resistant to chemical agents, and has no problems at all with cleaning and disinfection. Its battery lasts 6 to 8 hours (4 to 6 hours during uninterrupted use) and can be fully charged in 2 hours. Users do not need to worry about the batteries running out between rounds.

Howard pointed out that the Pocket Pad is notable for its identification mechanism because identifying patients is one of the most critical tasks during medical practice. Therefore, the Pocket Pad has an integrated barcode scanner that allows medical staff to read a patient's barcode and identify the patient before providing care, which is vital to avoiding unnecessary medical disputes.

For hospitals, medical carts are versatile care carriers with the primary function of facilitating the administration of medicines by nursing staff. However, nurses may not always be able to push the cart to a patient's bed because the aisles in the wards are relatively narrow. It is difficult for large carts to travel freely in wards. This is where the Pocket Pad can provide assistance, enabling medical staff to perform their bedside nursing duties such as accessing a patient's medical records, issuing doctor's orders, displaying medical images (i.e., reading from the PACS system), and taking photos of the patient's current state as well as archiving the photos, thus providing better and more comprehensive patient care. □

Lease-and-Use Patient Infotainment Terminals

As healthcare trends toward "patient-centric" services, an increasing number of hospitals have introduced patient infotainment terminals (PITs). A1 Telecom also recently entered this market with the provision of bedside information system leasing services that enable hospitals to provide value-added services at low cost.

Writer | Liao, Pei-Chun

Interviewee | Yi-Chuan Kuo, Key Account Manager, Advantech Digital Healthcare Sector;
Christoph Kuehn, Senior Key Account Manager, Advantech Digital Healthcare Sector

In recent years, hospitals in European countries have actively incorporated the concept of bedside service, resulting in PITs becoming increasingly ubiquitous. Such systems are constructed by hospitals to enhance individualized patient care services.

Yi-Chuan Kuo, Key Account Manager, Advantech Digital Healthcare Sector, described PITs as all-in-one medical bedside PCs that patients can use to conduct information inquiries, surf the Internet, watch television, etc. Although initially designed to enhance patient services, such systems can also help hospitals reduce costs. Because most medical records have been digitalized, physicians can access and study patients' medical records and images during ward rounds through PITs, and nurses can use such systems to ensure drugs are administered correctly. These systems not only improve work efficiency, but also facilitate convenient data maintenance and accurate drug administration.

A1 Telecom recognized the development trends in bedside information systems and understood that hospitals must control costs. Therefore, the company began leasing Advantech's PIT-1503 bedside information systems to medical centers. Christoph Kuehn, Senior Key Account Manager, Advantech Digital Healthcare Sector, indicated that A1 Telecom primarily provides services related to telecommunications, networking, and hosting. Locally, the company has garnered a good reputation and can take advantage of economies of scale. A1 Telecom not only leases network bandwidth to numerous medical institutions in Austria, but also hosts their servers, which contain health information systems (HISs) that store medical data.

Kuehn reported that A1 Telecom's system integration teams have installed PIT-1503 frames at bedsides to enable inpatients to surf the Internet, watch television, or listen to music during their hospital stay. Additionally, because PIT-1503 is equipped with an integrated magnetic stripe card reader and IC credit card reader, inpatients can pay for products and services, such as meal orders, television show and movie subscriptions, and/or daily necessities directly online.

Bedside Care Improves Efficiency and Enhances Patient Satisfaction

Hospitals that lease A1 Telecom PITs can benefit from the provision of value-added services without having to make major equipment investments. These systems are especially advantageous for hospitals with conscious, non-critically ill patients, who are able to move about freely. These types of patients have the greatest need for facilities with which to pass their time. The bedside services enabled by PIT-1503W can not only satisfy patient needs, but also enhance patients' treatment satisfaction.

In addition to the benefits mentioned above, hospitals can reduce costs by expanding the range of paperless applications with the provision of beside information systems. All the information that must be provided to patients, such as hospital leave rules, visiting hours, emergency escape routes, and health education information, no longer needs to be printed out and can be accessed directly by patients using PIT-1503W. Furthermore, during ward rounds, physicians only need to turn on a PIT-1503W system and connect to a HIS to access patients' medical records or images. This enables physicians to better ensure patients understand their condition/diagnosis.

However, because PITs are installed at patients' bedsides, the power cords, network cables, and other wires must be appropriately concealed in tubes to ensure the ward remains clean and tidy and to prevent patients from accidently pulling the cords and causing equipment failures or damage. For newly established hospitals, these systems can be directly installed during construction. By contrast, operating hospitals face a temporary close of approximately 2 weeks for the system installations to be completed. Therefore, before installation, hospitals must establish a thorough ward schedule to avoid disruption to daily operations.

Hospitals might also encounter hardware and software compatibility issues, as well as problems related to the integration or selection of peripheral devices. Some hospitals may even hope to incorporate specific software, such as nursing station

bed assignment systems, or hardware with outdated specifications, which can cause further compatibility issues.

Professionalism and Experience are the Keys to Successful System Integration

In actuality, PITs are not complex systems and can be developed from general consumer computers. So why did A1 Telecom select systems produced by Advantech? Yi-Chuan Kuo believes there are four main reasons for this choice. First, PIT-1503W 's fanless design eliminates noise and dust accumulation. Second, equipment in wards must be resistant to bacteria to prevent the spread of contagions. Advantech's medical tablet PCs are designed to facilitate excellent ward infection control. Specifically, antibacterial agents are added to the plastic casing during the injection process, and the device touchscreens are built to withstand detergent wipes. Third, the I/O, power cord, network cable, and USB slots are concentrated at the back of the device, which makes installation relatively quick and easy because the computer only needs to be mounted on a frame to conceal the cables and slots. Fourth, the equipment has passed medical safety certifications and poses no health hazard whatsoever.

Currently, numerous hospitals in various countries worldwide have incorporated PITs for a range of applications. For example, a certain overseas children's hospital designed and equipped PITs with gaming software aimed at stimulating children's intelligence. The National Maternity Hospital in Dublin, Ireland, installed PITs in seven prenatal and postnatal wards to display relevant videos about, for example, bathing a newborn baby, breastfeeding, postpartum discomfort, and the correct use of an infant car seat. These videos are provided for postpartum mothers to watch during their postpartum hospital stay to ease novice parents' anxieties and concerns regarding caring for a newborn.

With the growing emphasis on service quality, how to provide high-quality care and treatment during hospitalization has become a crucial topic for hospital managers. An increasing number of hospitals are expected to adopt PITs in the future. Professional equipment, as well as experienced partners, is vital for successful integration; without this, hospitals may encounter management difficulties and increased infection risks before experiencing any benefit. □

Integrated Digital Healthcare Treatment

To continuously improve service quality and reduce the costs of patient care, one of the top 10 teaching hospitals in the United States has upgraded its system in 2013 and incorporated the Advantech POC-W211 Medical Computers, thus creating an integrated digital operating room.

Writer I Liao, Pei-Chun

**Interviewee** I Frank Huang, Manager, Advantech Digital Healthcare Sector

This reputable hospital in North Carolina was founded in 1930, and has a total of three hospital branches in the cities of Durham and Rory in North Carolina. It is presently one of the top 10 teaching hospitals in the United States. To improve the service quality and reduce the costs of patient care, the hospital decided to retrofit its existing healthcare information systems in 2012, and incorporated Advantech's POC-W211 medical computers in 2013, along with software upgrades. The equipment is used in operating procedures from start to end in order to create an integrated digital operating room.

With up to 135 Systems, Management is Complicated and Costly

Prior to the IT system overhaul, the hospital had more than 135 types of electronic medical record systems that ran simultaneously. Such complex system architecture not only increased the cost of maintenance and operation management, it also kept the patient information scattered in different locations, making centralized management impossible. Therefore, the hospital decided to implement IT consolidation, to pool together the medical records at the University Hospital in order to seamlessly integrate patient medical records into a single system.

For the operating rooms, the hospital incorporated the Epic system to manage all of the data related to patient anesthesia, such as monitoring patients' vital signs. The information is stored and instantly transmitted to the back-end server. In simple terms, the Epic system provides a visualization of the integrated patient-related data such as height, weight, temperature, dosage, awareness, activeness, as well as other sensitive personal information, thus assisting the anesthesiologists and nurses in providing care for patients after surgery.

The hardware has also been upgraded to accommodate the new Epic system. Frank Huang, Manager, Advantech Digital Healthcare Sector indicated that the hospital originally used self-ODM equipment from a medical equipment supplier. However, past application experiences indicated that the system was difficult to use, and pricy. Therefore, the hospital decided to look for new equipment. After comparing a number of different solutions available on the market, it ultimately selected the Advantech POC-W211. It is now installed in the pre-surgery waiting rooms, in breathing detectors in the surgery rooms, in anesthesia machines, and in post-surgery recovery rooms, allowing the comprehensive monitoring of physiological states of patients, from the beginning to the end of surgeries.
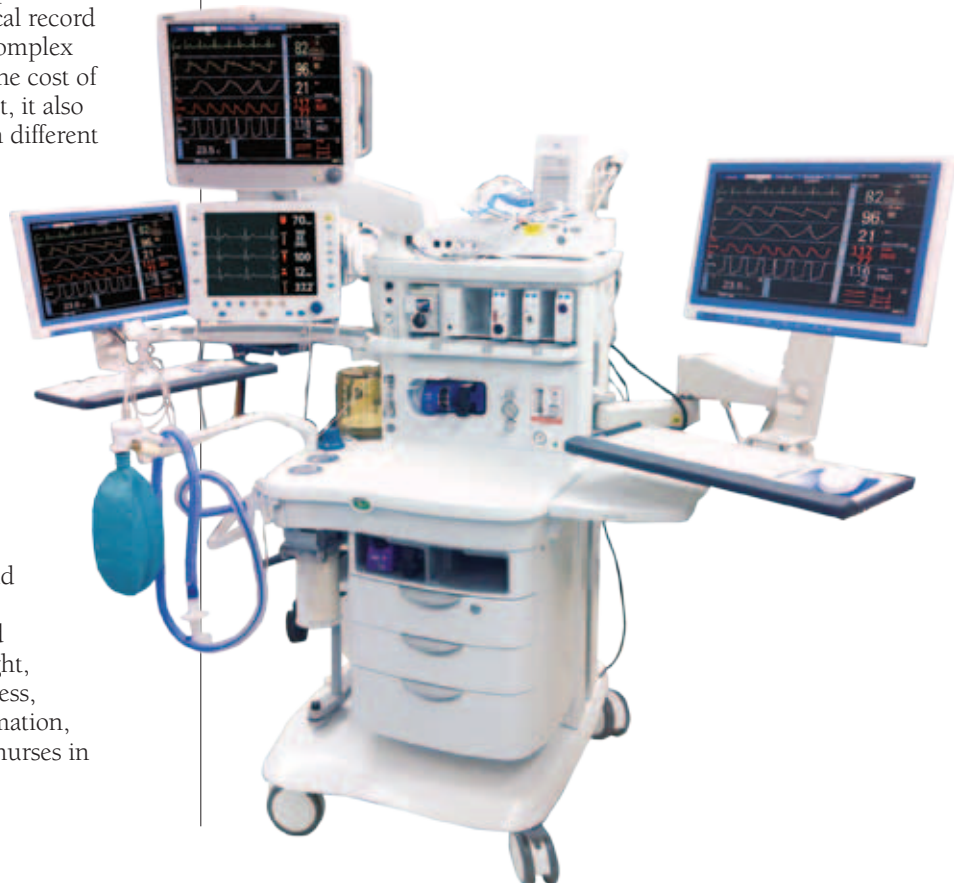
Advantech POC-W211: Seamless Integration, Easy Maintenance and Operation

Because medical equipment have very high operational stability requirements, the hospital only incorporated the equipment in a few small hospital districts at first, to conduct integration, functionality, and compatibility tests. After receiving excellent test results, the hospital expanded the integration into the main hospital and all of its branches. A total of 400 to 500 POC-W211s were installed. In terms of applications, they were gradually expanded because of their operating stability. Initially, anesthetists and nurses used the POC-W211 as a patient information reader. After verifying the reliability and stability of the equipment, staff began to use the networking capabilities of the POC-W211 to input and transmit medical records. Eventually, the equipment was instilled on the breathing detector and anesthesia machines.

In addition to stability, other features of the POC-W211, such as the multiple serial and network I/O ports, power-leak proof I/O ports, Electromagnetic Compatibility Test and UL60601-1/EN60601-1 third-party certifications, IP54 dustproof and waterproof capabilities, and the fanless noise proof and dustproof designs, were also factors behind the hospital's decision to install the equipment. The POC-W211's operational efficiency is two times that of the old equipment, and its 16 by 9 aspect ratio wide-screen design is also suitable for presenting Epic's large volume centralized data. In addition, Advantech has local application engineers that can provide instant maintenance and repair services, so the hospital does not have to worry about ongoing maintenance problems.

Frank further explained that for medical equipment, the fanless design is particularly important because it can keep out dust and dirt caused by personnel traffic. This is particular important for the pre-surgery waiting rooms, operating rooms, and post-surgery recovery rooms where infection control is critical. If the bacterial levels are not controlled properly and cause patients to become infected, hospitals may face operation risks such as lawsuits or evaluation downgrades.

The POC-W211 has three advantages compared to the general medical equipment. The first advantage is the reduced maintenance cost. Maintenance costs from major medical manufacturers are high, and once they dispatch manpower to the site, the hospital must pay the fee regardless whether the problem is fixed or not. The second advantage is the reduced complexity of system administration. Intra-hospital communication costs are high. According to the hospital's internal IT staff, they used to have to answer 30 phone calls a day in order to resolve various equipment-related problems. Now, they receive less than 3 calls a day. Finally, the third advantage is the reduced time taken for problem resolution. With just the basic settings, software installation, and compatibility testing, POC-W211 is easy to set up.

The hospital believes that the biggest benefits of incorporating the Advantech POC-W211 are the reduced costs and increased efficiency; these include maintenance, communication, and administrative costs. In the past, a general-purpose consumer computer was used for the pre-surgery waiting room, an international brand of medical equipment was used in surgery, and dedicated post-surgery monitoring equipment each had to be purchased from different vendors. Each set of equipment has a very high procurement and maintenance cost, and these diverse equipment brands also posed a burden on the management team. Now, since all of the computer-related hardware has been switched to the Advantech POC-W211, the IT personnel only need to deal with one brand. This has significantly reduced the complexity of communication and management.

Overall, the equipment offered by the traditional medical equipment manufacturers has high unit prices and maintenance costs, which makes it difficult for hospitals to reduce their operating costs. Consumer electronic products are comparatively unstable, and have more difficulty with infection control. The Advantech POC-W211 medical-grade computer operates in a stable and safe manner, has low costs, and is the best choice for the hospital to construct integrated operating rooms. □

Richard Wolf Creates Touch-endoscopic Equipment

Digital Integrated Operating Rooms Make Surgery More Efficient

Endoscopes, originally used for the photographic examination of internal organs, have been widely used in surgeries in recent years. Contemporary endoscopes are integrated with medical-grade computers to make it convenient for medical staff to manage and control the endoscopic equipment, and to make surgeries more efficient.

Writer | Liao, Pei-Chun
Interviewee | Frank Huang, Manager, Advantech Digital Healthcare Sector;
Christoph Kuehn, Senior Key Account Manager, Advantech Digital Healthcare Sector

Medical equipment has become increasingly more advanced, marching forward with the advancement of technology. Richard Wolf GmbH is a German medical device manufacturer that was founded in 1947; its primary products are endoscopic diagnosis and therapy equipment. Richard Wolf GmbH has 7 branches, 120 offices, and 1400 employees worldwide. To improve the efficiency and quality of endoscopic surgeries, Richard Wolf GmbH launched the Core Nova, a new set of endoscopic diagnostic equipment that uses the Advantech medical-grade POC-W211 medical computer as the control platform, which is responsible for the management and control of the endoscopic equipment as well as data input and browsing.

Designed Specifically for Integrated Operating Rooms

The Core Nova is designed specifically for integrated operating rooms, and comprises endoscopic medical instruments, hardware control units, and Core, the management system. Core operates on the hardware control unit, or on Advantech's POC-W211. Because all connected devices can be seen on the Core system interface, surgical medical staff can manage images, view procedural documents, or even perform telemedicine using the POC-W211 control device. Core is web based, so as long as healthcare personnel outside of

the operating room are logged in to the Core system through the Internet, they can collaborate with the healthcare workers in the operating room and complete the surgery together.

In additional to being a control interface, the POC-W211 can also be used as an information display platform. Richard Wolf GmbH can integrate one or more POC-W211s into an endoscopic diagnosis and treatment system based on a hospital's needs. For example, if two POC-W211s are installed, one can be used to display the Core system interface and the other one can be used to render the images captured by the endoscope.

Frank Huang, Manager, Advantech Digital Healthcare Sector, indicated that traditional endoscopic medical devices use general desktop computers, and healthcare workers can only log in to the management system or input data via a mouse and a keyboard. The Core Nova uses a medical-grade computer instead. The capacitive touch panel of the POC-W211 replaces the mouse and keyboard as the input tool, which eliminates the need for extra peripherals and cables.

For hospitals, there are two benefits to adopting an integrated machine to control the device and to input and browse data. The first benefit is that this method minimizes the risks of bacterial levels increasing as a result of contaminated dust gathering on wired devices. The second benefit is that this method saves space and keeps the operating room environment clean and tidy. Less than a year after the Core Nova endoscopic medical equipment was made available on the market, operating rooms in 40 countries have already incorporated the technology. The touch panel control interface method is very well received by hospitals.

Exterior Design Customization

Richard Wolf GmbH chose Advantech products primarily because of Advantech's product quality and brand reputation. The POC-W211's design offers

more than just integration between the host machine and screen; it also offers the advantages of stability, efficiency (using Intel® x86 chips), ease of installation, medical safety certifications, and a fanless design. The POC-W211 satisfies all of the functional demands of Richard Wolf GmbH, such as controllable endoscopes and third party display equipment. And no additional wiring is required during upgrades.

In addition, Richard Wolf GmbH is also very satisfied with the customization services provided by Advantech. First, the color and key visual themes designated by Richard Wolf GmbH for the POC-W211 were provided, which made the color consistent with their endoscopic medical equipment line, thus building brand awareness. Furthermore, Richard Wolf GmbH hoped to be able to detect the status of the various systems through the BIOS settings. For example, should the system become inoperable due to malfunctions, the system must be able to issue an automatic warning. This demand was met within just one week, after intense cooperation between the European and Taiwanese engineers.

Christoph Kuehn, Senior Key Account Manager, Advantech Digital Healthcare Sector, further pointed out that Richard Wolf GmbH's other equipment have already adopted Advantech motherboards. They have great confidence in the quality of Advantech products. When they decided to design the Core Nova in 2013, they originally elected to adopt the approach of the market in general and use conventional computers. However, after considering the fact that conventional computers did not pass the medical safety certification and their vendors do not have software integration capabilities, Richard Wolf GmbH decided to search

for appropriate solutions from Advantech. Advantech not only replied quickly, its product quality also met the demands. It only took one year to go from the first sample equipment testing to product shipment. The short time required to complete the project signifies that all of the test reports and certifications corresponded to the customer's expectations.

Frank believes that when European system integrators select products, the most critical factors to them are quality and stability, whether the products have passed medical safety certification, and whether the internal R&D process has been standardized. These are the questions often asked by the European SI providers. Advantech was already aware of this trend when it decided to branch out into the medical field. Advantech invested in obtaining the various medical safety certifications starting 12 years ago, and has standardized the R&D, design, and production procedures in order to provide quality assurance and enable its customers to use the products without any worries.

With the rapid advances in medical technology and the people's expectations for better health care services, hospital administrators are constantly looking for new methods to improve management efficiency, reduce the risks of human error, and save operating time. Advantech's POC-W211 applications have enabled Richard Wolf GmbH to transform traditional endoscopic medical equipment into an important factor in integrated operating rooms. This has increased the accuracy of accessed information, and satisfied the demand to transmit that information in a timely manner. □

Digital Logistics & Fleet Management

▸ Warehouse and Logistics

▸ Heavy Industry

▸ Fleet Management
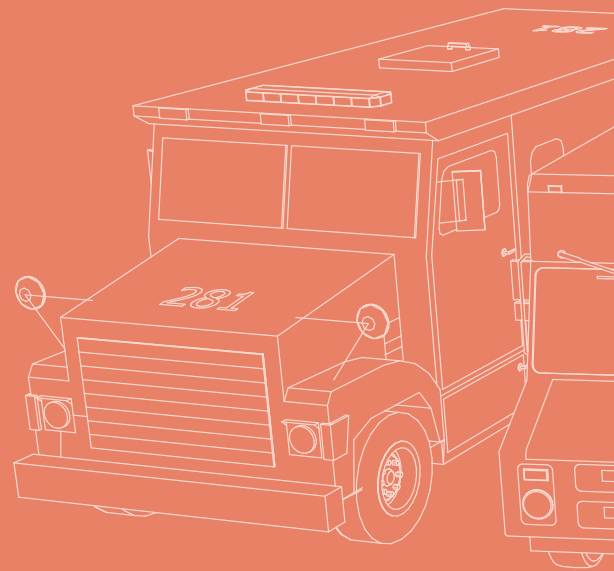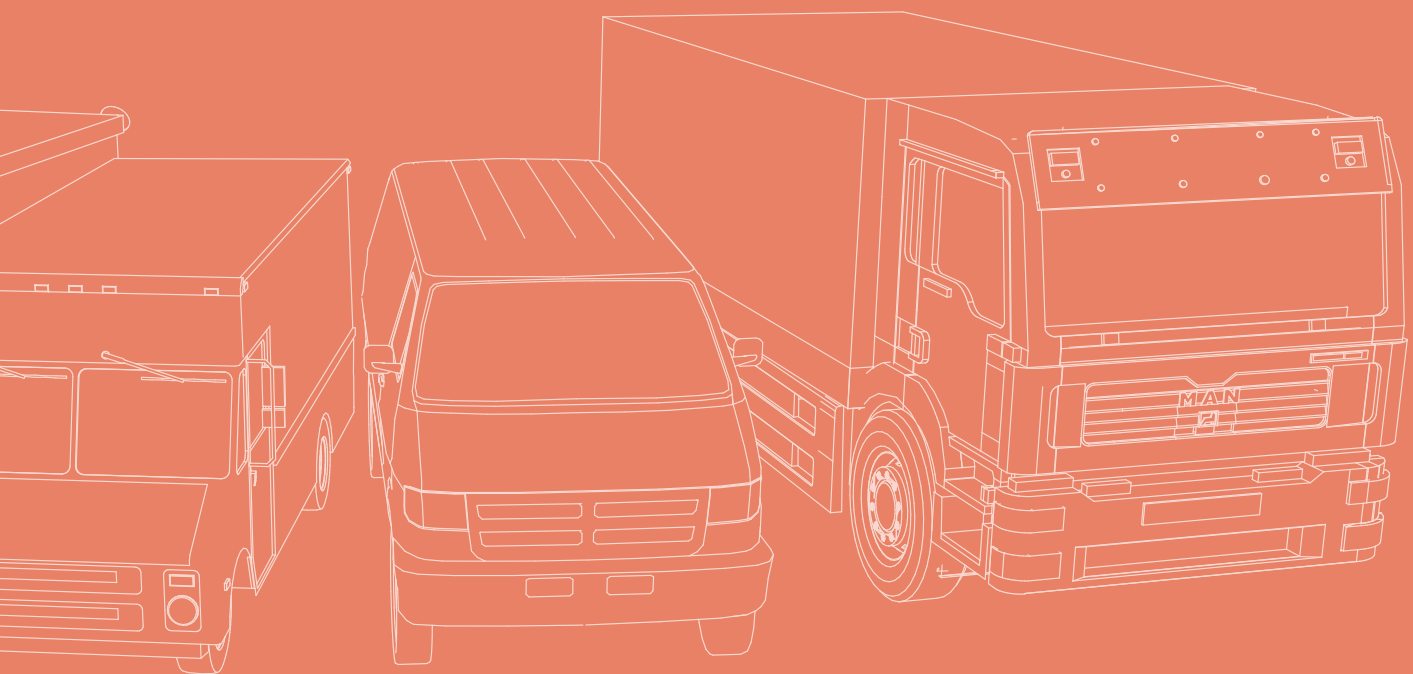
Comprehensive Use of Digital Logistics and Fleet Management can Achieve Higher Efficiency and Lower Costs

In the past, fleet management only provided vehicle location tracking and scheduling functions, but contemporary fleet management systems demand expedience, and this has been brought about by smart management systems that include: information systems, automation, networks, and the Internet of Things (IoT). This is the inevitable way forward for digital logistics and fleet management.

Writer | Yu-Feng Chen
Interviewee | Van Lin, Director, Advantech Digital Logistics & Fleet Management Sector

Commercial vehicles are the economic backbone and livelihood of most countries, delivering the food, products and goods that make our lives possible. Therefore, logistics systems are key to keeping all the cogs turning and the whole system running smoothly. Cost reductions and rapid delivery through effective management is the goal we all want to achieve. The logistics process involves transportation, warehousing, handling, packaging, distribution, processing, information intelligence, cash flow, etc. It covers a large and complex array of topics. As such, the need to integrate a digital logistics management system into traditional logistics systems has grown. Because road vehicles are at the center of logistics systems, the quality of the vehicle fleet management is critical to the success of the entire digital logistics management.

"Digital logistics and fleet management must be able to properly apply the information collected from the various parties in order to achieve immediate and effective monitoring so that the supplier side can provide the most efficient services for the demand side under the cost optimized conditions," said Van Lin, Director of Digital Logistics & Fleet Management Sector, succinctly describing the essence of digital logistics and fleet management.

As defined by Advantech, the logistics process can be divided into the harbor, large warehouse, small warehouse, warehouse center, and retail outlet segments. Advantech is ready in terms of the product offering and is able to provide any product or solutions to satisfy various transportation vehicle application demands.

Fighter Jet Grade Specification Enables High Stability for In-Vehicle Computers

Within the multitude of logistics management solutions, a rugged in-vehicle system is an absolutely essential element in order to provide a highly stable system for all the vehicles responsible for handling cargo in the logistics warehousing. Van explained that in-vehicle computers must take into account battery life, shock and vibration resistance, wide temperatures,

network transmission, and water and dust proof issues. We resolve them by providing professional software technologies and hardware designs that together provide excellent quality and automotive-grade PCs for fleet vehicles.

To meet stringent specifications, Advantech even introduced fighter jet aviation grade specifications into its product design to serve as a benchmark standard for the degree of ruggedness needed for each product because aviation-grade standards are stronger than industrial and military standards. So, while a competitors' product can withstand vibration and shock of 10G or less, Advantech products can tolerate up to 20G. In addition, Advantech has adopted water and dust proofing, wide temperature tolerance, and shock proof tempered glass touch screen panels as a basic specification for its products. Advantech's basic product specifications can withstand a variety of environmental conditions.

It's also worth mentioning that to help forklifts successfully perform their tasks, Advantech has included roaming, indoor navigation and 3D positioning functions into systems. The roaming function uses an optimized switching operation to enable the system to maintain network connection and prevent network disconnection. Indoor navigation is used in response to the introduction of high end positioning applications. The system is able to correctly guide the forklifts inside the warehouse to pick up the cargo from the correct shelf using RFID and Wi-Fi hotspots. Another 3D positioning method enables forklifts to obtain designated pallets or cartons from three-dimensional shelves that are stacked several meters high. At present, this system is successfully incorporated in the warehouse centers of Heineken in Germany, BMW, and IKEA in Sweden.

Save on Vehicle Fleet Fuel Consumption for Manpower, Logistics, and Cargo Management

The key for most digital logistics management systems, and what vehicle fleet managers care about most, is high efficiency and prompt delivery, and ensuring

that products are in perfect condition when they are delivered. This depends on whether the vehicle fleet can effectively control the manpower, logistics, and cargo. "Unlike the methods of control in the past, management efficiency has relatively improved as increasingly more and more IT technologies have been incorporated into fleet management," said Van. He broke down the new technologies to include in-vehicle computers, mobile devices, wireless communications, Internet, satellite positioning, electronic maps, traffic condition sensing, and video surveillance.

Advantech's solutions have perfectly incorporated the various technologies to provide a more flexible, immediate, and convenient vehicle fleet dispatch, vehicle location tracking, the best driving route, cargo condition management, emergency abnormal condition handling, and driving behavior management functions. As a result, managers can control the vehicles, cargos, and manpower as well as improve driving misconduct using the system monitoring and recording in order

to save fuel for the vehicle fleet and reduce vehicle damage.

Similarly, in anticipation of possible harsh automotive environments, the dedicated hardware and software provided by Advantech can ensure the smooth operation of the fleet management system. Advantech's system is also integrated with intelligent software that can transform the various accumulated data into meaningful information. Van stated that Advantech has provided fighter-jet grade in-vehicle products for many different types of fleet applications.

Van further stressed that Advantech has always been able to provide solutions for certain problems before the customers are even aware that they will encounter them. This "sales professionalism" attitude enables system integrators to provide comprehensive solutions for end customers and constructs the most efficient and comprehensive logistics systems available anywhere. □

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Smart Applications Enable Painless Warehousing Logistics Upgrades

Next generation intelligent warehouse and logistics systems can achieve real-time information and command through the help of smart technologies and flexible operating practices to accelerate the flow of cargo; and this in turn can reduce logistics cost, and operating schedules.

Writer | Xiao-Jing Yu
Interviewee | June Hsieh, Sales Manager, Advantech Digital Logistics & Fleet Management Sector

Mr. Xie has just arrived at the three-thousand square meter logistics center at his new company to attend his new staff training. As he looks at the thousands of products neatly stacked on the shelves in the giant warehouse, he realized that staff are able to operate the stackers, forklifts, and cargo removers methodically to complete the cargo storage and pickup operations. There is no hint of rush or confusion due to time pressures like he had witnessed in the previous warehousing company that he had worked for. This makes Mr. Xie wonder about the differences between the methods adopted by the two companies.

After observing and comparing, Mr. Xie realized that in his previous company, staff were always running to and fro from the office with stacks of cargo pickup orders. In the new logistics center, cargo pickup orders are already directly transmitted to the in-vehicle computers or to tablet PCs from the control center's computer network. With the help of barcode readers, staff no longer need to memorize a bunch of code numbers in order to pick up the correct number of cargo from the correct shelves. After cargo retrieval has completed, the warehouse management system would instantly and automatically update the inventory data while informing delivery staff to convey the cargo to the right exit and right pallet. The system can even automatically arrange for cargo with closer delivery locations to be loaded onto the same truck. So now, the vehicle fleet can quickly deliver the cargo to their destinations based on the optimal routes arranged by the system.

This comprehensive digital and paperless workflow not only replaces the manpower intensive operations of the past, it also significantly reduces cargo pickup error rates and improves efficiency. Mr. Xie thought that the chaos of the previous warehouse should now be a thing of the past.

New Generation Warehouse and Logistics System Emphasizes Immediacy and Flexibility

The complete logistics process is extremely lengthy. The process from the raw materials to the production site, the warehousing and distribution, and eventually the retail stores only include the distribution part. However, regardless of parts or material access for the factory production lines, general product shipments for warehouse centers, or point-to-point cargo shipments with the vehicle fleet; the traditional pen and paper methods are no longer appropriate. June Hsieh, Sales Manager, Digital Logistics & Fleet Management Sector, indicated that next generation intelligent warehouse applications can achieve real-time information and command transmission objectives through the help of technologies such as wireless, cloud services, GPS positioning technologies, in-vehicle computers, barcode readers, or handheld devices. This allows administrators to accelerate the flow of goods with immediate and flexible operations and effectively reduces the industry's logistics cost and operating times.

She also took warehousing operations as an example, and explained that fixed region cargo pickup or replenishment operations must highly rely on staff familiarity with cargo. In addition to lacking flexibility for the warehouse space utilization, the warehouse would also appear to have insufficient space for storage when the market demand has significantly spiked. Staff leave and vacations would also affect the smooth operation of the entire process. June Hsieh said, "Intelligent warehouse applications can determine the shipping center storage spaces instantly, enabling more flexible storage space planning, which surpasses traditional fixed storage space practices. When the in-vehicle computers and indoor positioning software can perform indoor navigation, the system can correctly guide staff to replenish or pickup cargo."

In addition, the system can also dynamically select and plan optimal routes. When a certain cargo mover has completed a task, the system can calculate the optimal route as well as the next most efficient task item. Therefore, warehousing operations would no longer be limited by the experiences of the staff, and the system can enhance the efficiency of the space and time as well as ensure the correct implementation of the whole operation. Such Advantech intelligent warehouse and logistics systems have already been adopted by numerous retail warehouse centers in the Greater China region. With the effective functions and wireless capability provided by robust and stable products, it not only enables prompt deliveries multiple times a day, it can also help product distribution centers for stores complete their cargo shipment and replenish operations.

Quick Material Pickup, Accelerated Production Line Efficiency

In addition to retail warehousing, the same concepts apply to factory production lines. For example, an automobile assembly plant that requires thousands of parts and dozens of execution steps can best highlight the advantages provided by intelligent warehouse applications. June indicated that, "The automotive industry commonly adopts "Just In Time" 'processes. Different parts must be delivered to each production line based on the different interior configurations for the various car models, such as different seat colors, materials, manual or automatic etc. How to correctly supply the parts and accessories from the warehouse for each production line is the key to ensuring a smooth operation. The production line would be interrupted if parts are delivered too late, and the operating spaces would be cluttered if parts are delivered too early and piled at the site."

Advantech's intelligent warehouse and logistics system can perfectly satisfy all these demands and meet with the factory production schedules to automatically notify the factory staff to deliver the appropriate components to the various production and assembly stations at the right time.

"Four years ago, BMW's automobile factory in Germany adopted Advantech's in-vehicle computers to perform the production line parts distribution operations. At present, the few hundreds of forklifts or pallet carts in this factory are installed with our computer systems, allowing the factory to achieve the objective of producing one car per minute. In the future, BMW also intends to incorporate our system into its various factories in China in order to improve their current production capabilities of producing one car per every five to six minutes. In addition to BMW, factories for the VW group, General Motors, Continental Tire, Yokohama Tire, and Goodyear have all adopted Advantech's solutions in order to enable their production lines to operate more smoothly."

June also emphasized that regardless whether it is warehousing operations or material access in manufacturing plants, the in-vehicle computers used must be sturdy enough to cope with a variety of environmental tests in order to ensure the stable operations of the systems incorporated. In addition, different storage patterns require different process flows to achieve optimal operational efficiency. Therefore, when Advantech plans the intelligent or automation applications for the industry, it would consider the customer's demands, perform on-site assessment, establish a smooth workflow, and then propose an appropriate program in order to make the new operation upgrade method as painless for the workers as possible.

Advantech has been active in the intelligent warehouse applications field for approximately two decades and its successful applications have spread across countries worldwide. Advantech has also accumulated a significant number of software systems and system integration partners. Using these advantages, June believes that Advantech can assist the traditional warehousing and logistics industry to plan the most sophisticated intelligent applications as quickly as possible. □

Emergency Vehicle Management Solutions Specifically Designed for Critical Operations

Accelerating Emergency Rescue and Disaster Relief Efforts

Emergency vehicles are primarily used in disaster relief and rescue efforts; thus, errors must not be permitted. Advantech's emergency vehicle management solution not only performs calculations and analyses based on collected information, but can also be integrated with medical equipment to ensure all opportunities to save lives are seized.

Writer | Yu-Feng Chen
Interviewee | Van Lin, Director, Advantech Digital Logistics & Fleet Management Sector

Emergency vehicles are primarily employed for tasks related to disaster relief and rescue, where even the slightest operational error can have unthinkable consequences. Therefore, the fleet management solutions installed in ambulances, police vehicles, fire engines, and rescue vehicles must be reliable and durable. If problems such as a lack of GPS signal or an unresponsive button arise during critical rescue or fire response operations, human casualties could result. Accordingly, high stability is an essential requirement for emergency vehicle fleet management solutions. The ability to immediately dispatch vehicle is also critical for rapid relief.

Van Lin, director of Digital Logistics & Fleet Management Sector, stated that "the exact location of each vehicle must be known to enable vehicle scheduling and immediate dispatch." However, in reality, several vehicles may not be displayed on the monitoring screen at the dispatch center. "These 'disappeared' vehicles may be located near high-rise buildings or in areas where GPS signals are obstructed, preventing the control center from detecting their location. This is detrimental to the accuracy of scheduling." To conduct rescue and disaster relief operations without delay, emergency vehicles must be dispatched accurately and precisely.

Supports Collective Intelligence and Optimization

Considering the requirements for emergency vehicles, Advantech's ambulance solution was designed to be integrated with medical equipment. Therefore, when a person is received by an ambulance and connected to medical equipment, the in-vehicle computer can transmit relevant data to the emergency room, enabling staff to understand the person's condition in advance and provide immediate treatment upon arrival.

The Advantech solutions adopted by several hospitals in Australia also feature live-feed capabilities. Images of the person's injuries can be transmitted from the ambulance to the hospital and displayed on the monitoring wall. Because the severity of injuries dealt with by ambulance staff varies widely, the monitoring wall can be used to determine the most serious injuries and identify the persons who should be prioritized by medical personnel. By adopting this remote medical assessment model, ambulance staff can provide more than just transportation. Instead, the ambulance response becomes part of the treatment process, greatly accelerating injured people's receipt of appropriate

medical treatment.

This collective intelligent decision-making model is also widely employed for firefighting operations. With this model, in-vehicle cameras are remotely controlled from a backend control center to obtain video footage of the onsite conditions. The transmitted videos and images are then displayed on the backend monitoring wall, enabling staff to provide the team captain with appropriate instructions and recommendations; for example, guidance to shut off the power supply to certain areas.

Powerful Computing Capabilities for Immediate Processing

Because rescue operations are time sensitive, the in-vehicle computers installed in emergency vehicles must have high computing power to satisfy the need for immediate processing. Most in-vehicle computers currently available on the market can only function as data acquisition devices. Without sufficient computing power, they cannot be used for processing, analyzing, or making decisions based on collated data and calculated resources. Instead, data must be transmitted to a backend control center for analysis; the results of which are then transmitted back to the scene. These back and forth exchanges of data can cause delays in essential rescue and live-saving operations. According to Van, "Although numerous cities claim they have sufficient network bandwidth, this is not necessarily the case. Thus, one cannot totally rely on the backend for processing during emergency operations."

From this perspective, the in-vehicle computers installed in emergency vehicles must have data collection, calculation, and analysis capabilities. Compared to most in-vehicle computers featuring a 400 MHz RISC architecture, 16 MB of RAM, and no operating system that are currently available on the market, Advantech computers feature a high-end 1 GHz RISC architecture and reliable operating systems that use low-power automotive-grade Intel®

chipsets. These systems are equipped with extensive communication and I/O expansion capabilities for performing calculations and analyzing collected data. Furthermore, their high computing power also enables the operation of simulation and database software.

"Notably, the fleet management equipment installed in emergency vehicles often has conflicting specifications. Regarding police video evidence collection capabilities, police vehicles must be equipped with at least four remotely controlled high-definition, high-resolution cameras and substantial storage. Additionally, the system must be capable of performing video encoding/decoding, storage, and streaming, as well as instant data transmissions."

To satisfy these demands, fleet management solutions must have sufficient computing power and storage capacity, which results in the generation of more heat and increased susceptibly to vibrations. Such problems are difficult to overcome and hinder companies from entering the fleet management solutions industry. Van stated, "This is exactly why Advantech chose to enter this field. We believe that we are the vendor most capable of achieving a breakthrough for this industry by developing solutions that offer a valuable contribution to emergency relief efforts." □

Heavy industry vehicles, such as mining vehicles, agricultural machinery, and cranes, cannot be driven on standard roads. These vehicles are typically operated in extreme environments with harsh conditions, for example, dusty mines and/or bumpy terrain, they must be able to withstand severe vibrations during transport or mine-drilling operations. Furthermore, for operations such as underground salt mine excavation, heavy industry vehicles must be resistant to salt corrosion. Overall, the harsh working conditions faced by heavy industry vehicles also pose great challenges for in-vehicle system vendors.

Van Lin, director of Advantech Digital Logistics & Fleet Management Sector, highlighted that, "Ruggedness and stability are critical for in-vehicle computers. Such systems must be capable of normal operation in dusty environments and under strong vibration, and able to withstand comparatively rougher handling by heavy industry vehicle drivers."

The degree of ruggedness required for in-vehicle devices specifically developed for heavy industry vehicles exceeds not only that for general industries,

but is also 3 to 5 times higher than military standards. Therefore, besides being waterproof and dustproof, Advantech machines are equipped with impact and shatter resistant solutions that protect the most vulnerable part of the computer, namely, the LCD panel. Van stated, "To test these machines, a 500-gram iron ball was dropped from a height of 1.3 meters onto the LCD panel, which emerged unscathed."

Function Modules can Increase Safety in Dangerous Mine Environments

Because heavy industry work environments typically do not feature standard roads, vehicles can encounter unpredictable conditions during operations. A vehicle fleet management system can provide assistance in monitoring relevant data and issuing alerts for a variety of unusual conditions to increase the safety of onsite operators and reduce the risk of property damage. Consider the case of a gold mine in South Africa that implemented Advantech's real-time dispatch management system for mine fleets as an example. The integrated functions of Advantech's in-vehicle computers were used to add various management modules, such as collision avoidance, oil level

monitoring, weighing, and tire pressure monitoring systems. Relevant data was transmitted by in-vehicle computers to a backend management platform to be displayed on a monitor, providing onsite operators with the latest information.

Van illustrated the importance of tire pressure detection and stated that, "If a tire chain of a mining vehicle breaks, the vehicle will be out of commission for 1 or 2 months. Because mines are generally located in remote and desolate places, delivering a tire takes a substantial amount of time."

Using Advantech's mine fleet real-time dispatch management system, instructions for vehicle dispatch and scheduling can be transmitted to in-vehicle computers to inform the drivers. Furthermore, the in-vehicle computer platforms can also collect relevant data, including driver login and logout times, engine activation times, number of pulled mine carts, and ore quality. This data is displayed on the in-vehicle monitor and transmitted to the backend management platform.

If emergency situations such as road collapses occur, the driver only needs to touch the in-vehicle computer screen to transmit a distress signal and the vehicle's location to the backend management platform for immediate assistance. This is an extremely useful function for the mining industry. In the past, drivers could only shout for assistance, but their cries might have been obscured by other onsite noise. Monitoring driving speed is another significant issue. Generally, drivers tend to accept the risks associated with speeding in order to deliver more loads and obtain higher returns. The speed monitoring function of Advantech's system warns drivers of illegal driving behaviors to ensure effective fleet management.

Self-Propelled Agricultural Machinery Emphasizes Positional Accuracy

Advantech's fleet management system has also been installed in self-propelled agricultural machinery. The demand for such equipment is substantial,

particularly in the vast farmlands of China. For the agricultural machinery leasing industry, the integration of an intelligent fleet management solution provides managers with a complete overview of the machine usage during the leasing period, the distance and area of cultivation, and whether the equipment service life was reduced through incorrect use.

For both the lessors and lessees, the primary requirement for self-propelled agricultural machinery is accurate positioning. Highly accurate GPS devices and local positioning systems can improve agricultural output efficiency. The error range for general GPS devices is approximately 10 meters, which differs significantly from the 1.5-meter error range required for self-propelled agricultural machinery.

To provide greater accuracy, Advantech adopted a different GPS solution. Van explained that Advantech currently offers two fleet management solutions that have an error range of 0.7 ~ 1 meter and 0.3 ~ 0.5 meters. "The self-propelled agricultural machinery positioning solutions developed by Advantech and our partners have an error range of less than 1 meter."

Currently, the primary requirement for cranes, another commonly used heavy industry vehicle, is that partial or complete images of the vehicle surroundings can be displayed on in-vehicle monitors installed in the operating cabin. Thus, vehicle operators no longer need to rely on other personnel for directional guidance, further enhancing operational efficiency.

By integrating Advantech's intelligent fleet management system, the operational efficiency and safety of heavy industry vehicles can be dramatically improved. However, because of the nature of heavy industry work environments, the ruggedness, stability, and accuracy requirements of heavy industry vehicles are higher than those of general industry vehicles. Thus, relevant companies must select the appropriate fleet management solution to reduce risks and achieve the desired results. □

Intelligent Building & Intelligent Campus

‣ Intelligent BEMS

‣ Intelligent Space Management
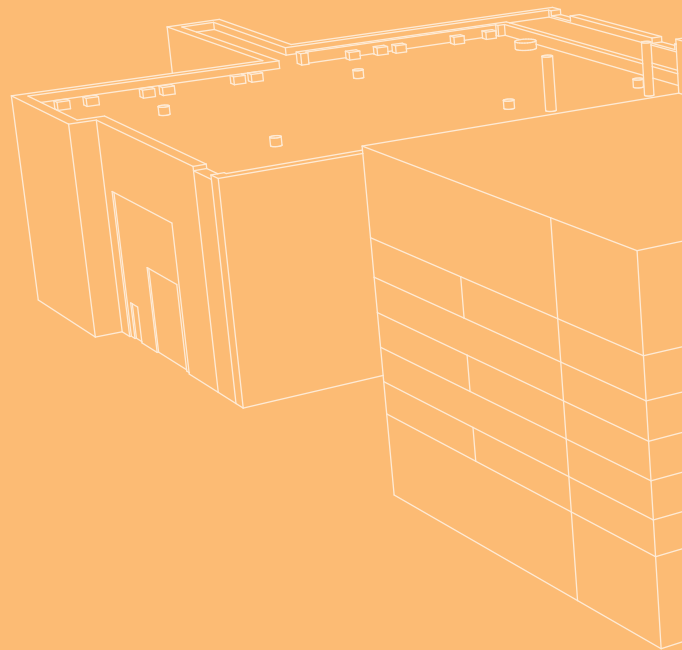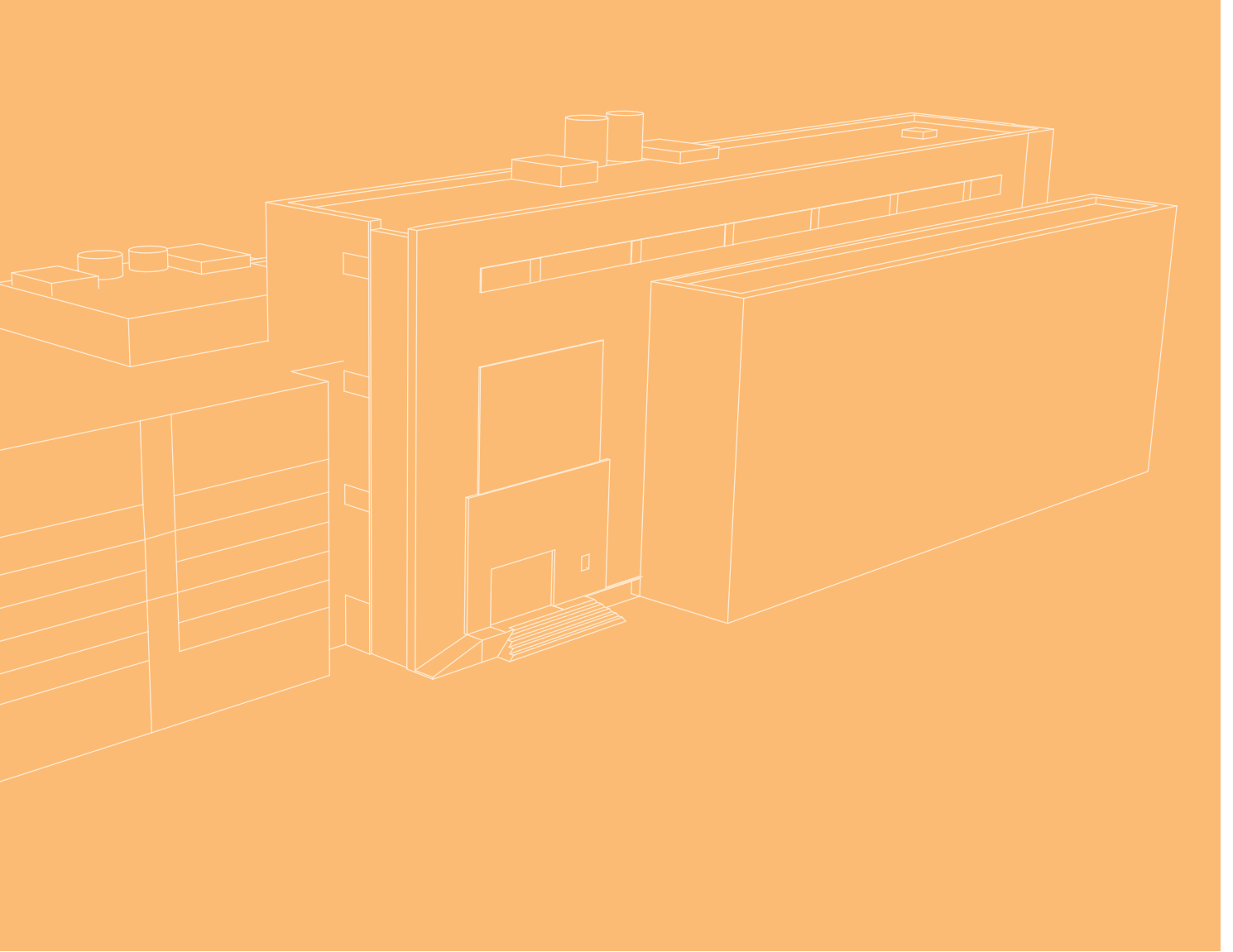
Predicting Cities' Innovation Levels from their Intelligent Buildings

The Chinese market is forming a glorious arena loaded with abundant capital and technologies. In the future, the quality of intelligent buildings must be enhanced through refined yet innovative designs and more human-centered applications. The service-oriented thinking required by this market is Taiwan's advantage and Advantech's expertise!

Writer | Pei-Wen Yu
Interviewee | LH Chou, Director, Advantech Intelligent Services

Currently, China has 36 smart cities under development, and intelligent buildings form the cores of these cities. Generally speaking, "intelligent buildings" use information and communication technologies to serve as their brains and nervous systems, in order to provide more convenient and comfortable living spaces. Eco-friendly design is another important objective of intelligent buildings.

According to a green tech survey conducted by Nikkei Technology, the global intelligent building market in 2020 should reach JPY$65 trillion, with the Chinese market accounting for 1/3 of the global total, or as much as JPY$24 trillion (approximately US$236.18 billion).

Looking at opportunities in green buildings, the British market research firm BSRIA predicts that by 2020, the intelligent green building market in Asia will reach up to US$1.36 trillion, and China will account for up to 46% of this market. The enormous size of the market should enable advanced building technologies and services to thrive. Just system integration alone should be worth approximately US$50 billion in value.

Innovation Wins in Smart City Construction

The Greater China area is a crucible full of challenges, as it is a competition stage for the world's elite players; and the next five years should be a phase of rapid growth. How can enterprises take advantage of the huge business opportunities? LH Chou, Director of Advantech Intelligent Services, indicated that the key is to master the "highlights" that attract market attention, i.e., designs with a deep sense of surprise and awe.

Chou mentioned an example: the Hongqiao station in Shanghai is so complex that it is easy to get lost. Fortunately, there are several location navigation units where users need only place a thermal paper in front of the lens, and a 3D map of nearby landmarks is projected onto the paper.

So, the attractiveness of a city is not just driven by technology; instead, it is more important to have

"highlights" in the creative design! This is the only way to win the approval of users.

Current construction techniques and technologies are growing by leaps and bounds. Unfortunately, some owners' impressions of "intelligent buildings" are still limited to concepts of "building automation" or the single-device focus stage. Mobility, integration, and the far-reaching service value required for true intelligent buildings are not major foci for them.

As a result, Chou also pointed out that "intelligent services" can only be fully implemented if smart and innovative designs for buildings are carefully considered and adopted to satisfy the needs of the people. This is what prompted Advantech to construct a smart building demonstration zone to realize "Hollywood-style" future technologies and open up the infinite possibilities of intelligent applications!

Collaborating to Construct Intelligent Buildings and Drive Smart Cities Forward

The Advantech Kunshan A+ TC collaborative R&D center was completed in 2014 and the "Intelligent Building Partner Conference" was held at the same time. Numerous Taiwanese guests traveled thousands of miles to attend the conference, and people from various provinces of China also participated enthusiastically. Design schools, construction companies, and the Shanghai Smart Building Association formed delegations to participate in this event. More than 200 intelligent building industry partners in the Greater China area joined in on the festivities and even had all-night discussions.

More surprisingly, more than 50 business operators initiated a forum the next morning to start advisory discussions, such as the various ideas of the "Technology Incorporation Architectural Planning Phases" proposed by a locally renowned institution in China.

Some business operators were very direct, and conducted focused discussions on appropriate solutions for specific buildings. As consultant and joint partner, Advantech answered the participants' questions and analyzed the feasibility and benefits of the various space applications proposed, thus igniting more sparks of creativity through in-depth discussions.

Different Values, Novel Reflections

The unprecedented enthusiastic responses meant that the visitors were able to see different values. Even though there is no shortage of smart technologies and solutions for smart buildings, the difference is that Advantech has first to aggregate the best available technologies in order to achieve optimized solutions. Advantech's intelligent buildings contain two core applications: Intelligent Building Energy Management and Intelligent Space Management. Each core contains several sub-systems that are interlinked.
Take Intelligent Parking for example. Conventional parking guidance systems only provide general instructions, which can be confusing and can make it difficult for drivers to find the exact location of a vacant spot. The Advantech Intelligent Parking solution assists visitors to pull into precise parking spaces and find their cars in the shortest time possible when departing.

The mere mention of the most prominent central control room for an entire building makes all employees more aware of energy conservation, which contributes to the company's energy-saving policy. The Mobile App initiative also enables easy monitoring, management, and maintenance processes to achieve more efficient operation that can save on manpower. All of these are the embodiment of value for innovative applications.

Collaborative Innovation to Develop the China Market

Three years ago Advantech had first to consider usage requirement scenarios and application models as it planned for major intelligent parks in Kunshan and Linkou; the resulting plans formed the basis for seeking technical support and developing new technologies. The newly-constructed, Advantech-designed spaces are both sleek and practical.

Despite the difficulties involved in these achievements, Advantech is happy to share them with its partners. Kunshan Campus is named as a "Collaborative" campus because Advantech expects to bring its partners in Taiwan into the China market, and combine forces with local SI partners in China to devise a more comprehensive collaboration system and expand into diversified services.

Some vendors originally offered only hardware. After their collaboration with Advantech and software content was integrated, their products were upgraded into solutions and become irreplaceable innovation projects. Naturally their value was also upgraded.
In the future, Advantech's two intelligent building demonstration zones will continue to search for feasible innovations, attract enthusiasts to participate in cross-border collaborations, and jointly create smart building role models! □

Green Business Opportunities Appear as Enterprises Step-up on Energy Savings

As the trend towards saving energy increases in popularity, enterprises are starting to incorporate energy management platforms capable of accurately capturing and analyzing data, as well as making predictions. Environmental protection is not merely a social responsibility, it can also generate green business opportunities and competitive globalized developments in the future!

Writer | Pei-Wen Yu
Interviewee | Gary Wang, Project Manager, Advantech Intelligent Services

While returning from a meeting at his company's headquarters, Gary, who works as an associate manager of a convenience store, joyously contemplates the company's decision a few years ago to adopt a building energy management system (BEMS) in an effort to reduce operating costs. Despite the initial resistance from within the company because of the increased investment required and obstacles to learning, the system has not only reduced the complexity of energy management programs and the frequency of human errors, but also generated considerable savings in energy costs.

Currently, Gary can simply log into the company's BEMS webpage using his smartphone to identify in which months electricity consumption was the highest and what equipment consumed the most energy to compare the annual electrical usage statistics to those from the previous year. The system can turn relevant equipment on or off automatically or propose energy-saving plans based on the operations schedule. Gary can also alter the system scheduling rules based on the marketing plan and seasonal climate changes, as well as monitor the implementation status at any time. For convenient stores that run their lights and air conditioning units continually, 24 hours a day, these

functionalities can provide substantial annual savings for an amazing return on investment.

Data Visualization is the First Step in Reducing Building Energy Waste

Because of escalating extreme climate conditions and environmental problems, energy conservation has become a basic developmental requirement for cities. Energy usage serves as an important indicator of whether contemporary architecture has become smart. According to recent market surveys, a large proportion of the energy consumed in many countries is generated by buildings. For example, buildings account for over 50% of the total energy consumption and carbon emissions in the UK.

In 2014, data from the Taiwan Architecture & Building Center indicated that although the ratio of new to old buildings is 2: 98, old buildings account for approximately 40% of all energy consumption. Despite the influence that the building occupants' habits have on energy consumption, old buildings typically lack effective energy use control mechanisms, which is the most important factor.

The primary issue is that old buildings are equipped

with outdated power lines and equipment, and do not provide reference data. This hinders owners from monitoring electricity consumption or implementing improvements. Therefore, Gary Wang, Project Manager, Advantech Intelligent Services, asserts that the first step to energy conservation is visualizing and digitalizing building energy consumption to enable owners to fully understand the problem.

Advantech's BEMG series and Building Energy Data Acquisition systems collect energy consumption data to provide a basis for analysis, improvement, and timely energy use adjustment strategies. The Chinese government recently established the Building Component Measurement Guideline, which mandates that all provinces, cities, counties, and regions record and report their building energy use data to facilitate the assessment of building energy consumption and formulation of improvement plans. Business owners and construction companies can also reference this data to review the environmental impact of their buildings. This policy has resulted in energy data collectors gaining popularity in China.

In addition, managers can monitor the energy consumption of various company buildings via the Internet and using mobile devices, without ever physically visiting the site. Monitoring and analyzing data remotely enables multinational enterprises to reduce manpower and transportation costs and implement real-time energy management strategies.

Simplify Enterprise Energy Conservation Using Advantech's IBEMS

Advantech's Intelligent Building Energy Management System (IBEMS) comprises the WebAccess open integration platform, WebAccess+BEMS energy management system, and WebAccess+Director intelligent linkage applications. This allows enterprises to select the appropriate management tools based on their needs.

These pieces of software are not only configured with a full range of management functions, but also feature intuitive interface designs. The software is designed to enable users to configure and customize the interfaces flexibly and to select the most frequently used widgets, such as those displaying demand analysis pie charts, weather conditions, and company maps. The design objective was to make the software as easy to use as a

smartphone app. WebAccess+BEMS is also equipped with KPI sorting and calculation functions that enable all employees to participate in enterprise energy conservation.

The Songshan Cultural and Creative Park, a multipurpose development that comprises hotels, restaurants, retail units, offices etc., has adopted the Advantech IBEMS solution. The energy management platform constructed using Advantech's DDC and WebAccess can simplify complex management measures into simple SOPs to significantly reduce energy consumption.

The ultimate goal of energy data collection is to identify the optimal solution. Currently, Advantech's Intelligent Services division has already developed basic smart analysis functions. In the future, Advantech plans to use an expert diagnostic system to perform building-specific energy use diagnoses, similar to a general health checkup. In addition to data collection, this system must have analysis, simulation, and prediction capabilities to assist businesses with establishing more precise guidelines for energy efficiency.

Green Enterprises are a Modern Trend

Gary stated that enterprises must accept greater social responsibility, and that leading global brands are duty-bound to protect and care for the environment.

For many years, Advantech has facilitated efficient energy management with its IBEMS solution. This solution has been adopted by FamilyMart, Yuan Ze University, in corporate buildings, hotels, Chang Gung Memorial Hospital, and other pioneering companies in an effort to reduce electricity costs and enhance their green energy credentials.

In addition to more advanced energy systems, Advantech's Kunshan A+TC Campus features design innovations such as solar energy trees, wind turbines, and rooftop solar panels. These utilities are setup similar to an all-star major league baseball team, with each member (device) assigned to differing locations and contributing value through varying means. The Kunshan A+TC Campus demonstrates Advantech's ongoing commitment to energy conservation and environmental appreciation as the company continues to provide optimized energy conservation solutions to corporations worldwide. □

When Buildings Warm Up the City is No Longer Cold

Advantech Intelligent Space Management Creates Humanistic Spaces Everywhere

Advantech's intelligent building solutions help optimize interior building spaces to deliver fully automated services through intelligent building management. They provide convenient everyday services for employees, welcome visitors and help them feel at home, and assist managers who care about efficiency.

Writer | Pei-Wen Yu

Interviewee | Jason Miao, Business Development Manager, Advantech Intelligent Services

Jason taps his index finger on the steering wheel and looks at his watch. He has been driving a long way up north to visit the Advantech Linkou Campus, but is stuck in traffic and is really upset because he will be 15 minutes late.

Finally, Jason reaches the Advantech building and breathes a sigh of relief. He slowly drives close to the parking lot entrance and rolls down the window to tell the security guard of his purpose for the visit, but he discovers that there is no security guard in the booth. At this time, the vehicle license plate recognition system recognizes Jason's car and opens the entrance gate immediately.

The parking guidance system provides precise instructions: "turn left, turn right, go straight", etc. The signs shown by the digital signage are precise, and it takes less than a minute for Jason to reach his exclusive parking slot. To his surprise, the flashing billboard above the parking slot displays, "Welcome to Advantech Jason".

When Jason reaches the i-Reception area in the lobby, the beautiful virtual receptionist in the digital signage at the counter asks Jason to head to his right, to the automatic ID acquisition area in order to enter his data and obtain a visitor's permit. At the same time, the system also notifies the member of staff with whom he has arranged an appointment. The intelligent building system has auto-administered the whole process which significantly reduces labor costs. If this system was applied in larger buildings, the economic benefits could be significant.

At the left side of the reception area there is an Interactive TV Wall set up. Here, visitors can browse the company's corporate and new product information, and even email an e-catalog to their own mailbox. After Jason's visitor ID has been sensed by RFID, he receives free coffee coupons. He even takes two souvenir photographs using the interactive features.

Simplify the Meeting Reception

Subsequently, the contacts greet Jason and lead him to the i-Meeting rooms. The floor has dozens of conference rooms, but they instantly find the one that they had reserved. If a green light is shown on the front of the door, that means the room is reserved and not being used. This enables users to quickly find their destination with one glance.

In the conference room, thanks to environment sensing technology, the air conditioning and lights are already set up and there is no need to wait. When looking at projections, the Advantech Scenario Control System immediately switches from leave mode to projection mode. The system is designed for a diverse range of meeting requirements and helps improves the efficiency and quality of the meetings.

After the meeting is over, the light and air conditioning systems turn off automatically. When it's time to leave, Jason finds that he has forgotten where he left his car. However, thanks to the Car-searching System, Jason is able to easily find his car via the touch panel signage. These business friendly processes help leave a lasting

Human Sensing Control

impression on the customer and they in turn gain more respect for the company's outstanding image and technical leadership.

Efficient Management, Double the Results

In Advantech, employees dispatched to branch offices in foreign countries can also use their Smart Cards to enjoy a higher degree of convenience. Regardless of whether it is an entry access card, facility application, meals or numerous other services, the benefits are not restricted and other convenient functions can be used to help to improve work efficiency and productivity.

Jason Miao, Business Development Manager, Advantech Intelligent Services, indicated that all of these applications can be integrated into a single platform to streamline and manage iBuilding solutions. Take our video surveillance systems for example, they are integrated with the Advantech WebAccess+IVS software to enhance building safety. WebAccess + Director software is also used to apply intelligent functions in order to provide better building services. For example, if the conference room is packed with hundreds of people and the sensors have detected an excessive concentration of carbon dioxide, the system would automatically connect to the total heat exchanger or air conditioning to start balancing the air quality and heat ventilation.

A central control mobile app has also been developed to offer a anytime-anywhere control capability. In the past, repairs, and maintenance routines required at least two administrators. Now it takes one person with an Advantech industrial tablet PC and the mobile app to complete all of the tasks.

The Value of Technology is in the "User Experience"

To demonstrate the full range of intelligent management applications, Advantech has constructed the Kunshan and Linkou campuses and incorporated IoT technology to demonstrate numerous intelligent building and

intelligent management solutions. These examples not only enable visitors to enjoy a more rewarding experience, they also prompt potential system vendor partners to witness the benefits of intelligent buildings for themselves at first hand.

These days people want a more human touch from science and technology. Convenience is not everything and Jason Miao believes that a quality experience is the key. Taiwan's tech advantage is perfectly illustrated in their approach to design. By developing user-friendly solutions, Advantech's Intelligent Services provide the best in innovative technology in order to create more value and establish a future role model for the industry. □
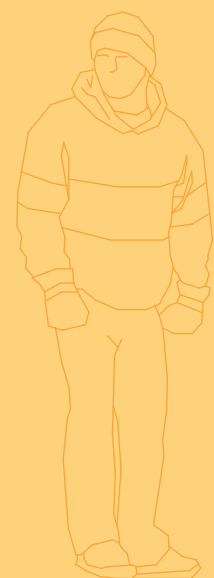
Intelligent Parking

Smart Card

Intelligent Retail

- Intelligent Retail
- Intelligent Public Service

Intelligent Retailing Creates New Shopping Experience

Retail Industry Welcomes O2O Generation

With the trend toward O2O (Online to Offline), which represents integrating physical stores and online shopping, the question of how retailers make use of information technology to move toward an intelligent system, enhance consumer experience, integrate multiple channels, and improve store management efficiency will be the keys to maintaining market competiveness.

Writer | Liao, Pei-Chun

Shopping is something that everybody does almost every day. Over the past few years, e-commerce has become increasingly prevalent, and physical store operators are facing significant challenges to their survival. However, in recent years, there has been a change in the idea that competition exists between physical and online stores. Today, retailers emphasize integrating the characteristics of virtual and physical stores, and make use of IT to develop intelligent retailing. This increases store management efficiency, and also gives consumers a new shopping experience.

For the last eight years, IBM has been publicizing their "five future innovative technologies (IBM Next 5 in 5)", which are five innovative developments that are predicted to change how humans work, live and interact within the next five years. One of 2013's five innovative technologies was "Buying local will beat online". IBM believes that physical stores will once again ignite shopping booms, especially after integrating online transactions, which will make physical stores more competitive.

Indeed, the O2O business model of integrating online and offline stores has become very popular throughout the world, especially for China's e-commerce or physical retailers, who crossed over to the O2O market through mergers and acquisitions. For example,

e-commerce giant Alibaba invested 5.37 billion Hong Kong Dollars for a stake in a large departmental store, Intime Retail Group. Both parties announced that they will build an infrastructure that integrates online and offline business. The biggest electrical retail chain, SUNING Commerce, made a 100% acquisition of well-known group-buying website, Mazuo.com, promoting the O2O business model.

In the beginning, O2O was an online-to-physical e-commerce model, where discounts are offered on the Internet, and consumers make online orders, then collect products or receive services from a physical store. Group meal vouchers are one such example. Afterwards, O2O evolved, and started to include Offline-to-Online, linking physical stores back to the Internet. Examples include using mobile phones to scan barcodes and comparing prices on the Internet, checking in on Facebook to receive gifts, etc.

Be it online-to-physical or physical-to-online, the spirit of O2O is to link up virtual networks and physical stores. It provides consumers with a pleasant shopping experience, and thereby stimulates consumption. David Lai, Chief Operating Officer of AdvanPOS Technology, said that in the past, most people believed that competition existed between virtual and physical stores; the bigger the scale of the virtual transaction
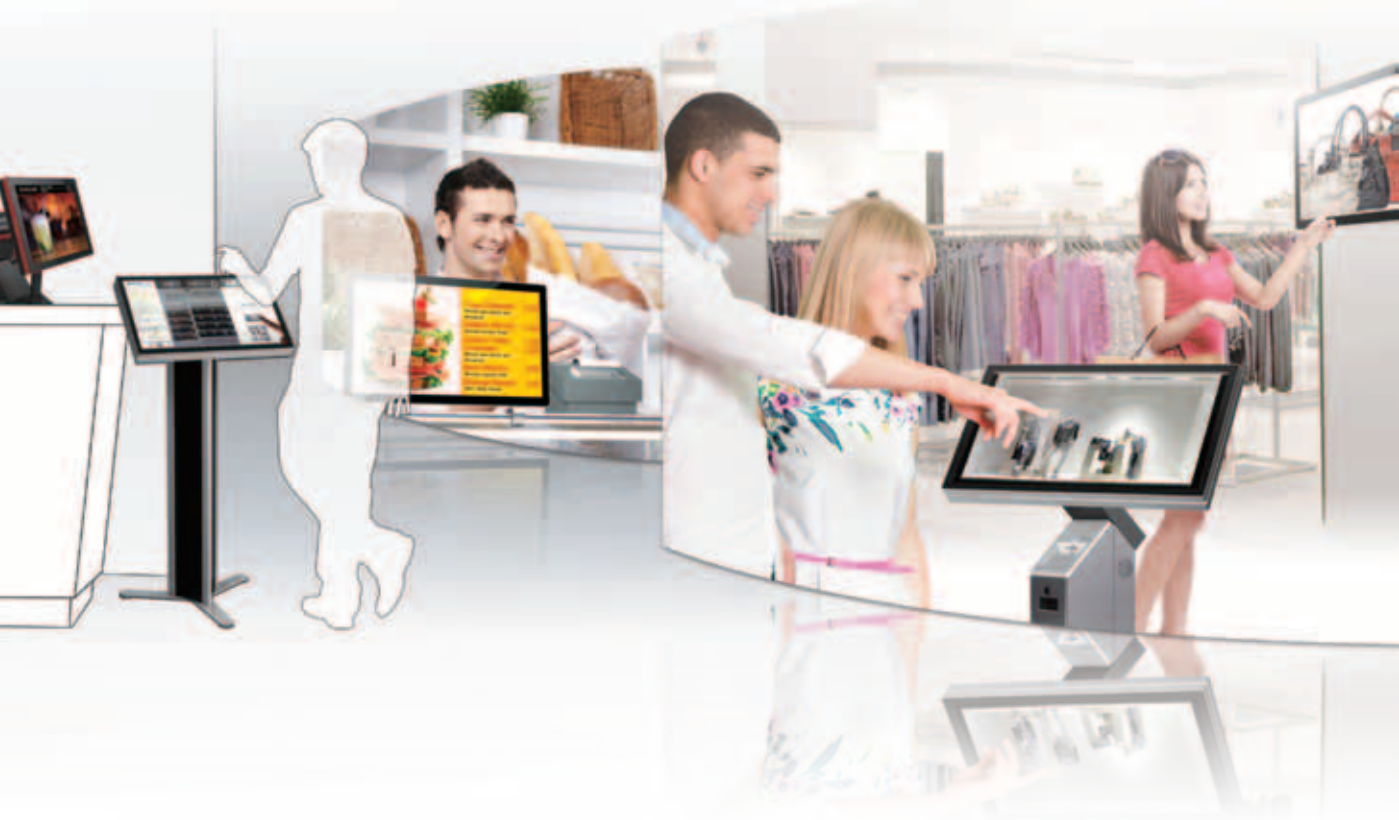
market, the more unwilling the consumers were to visit physical stores. From what we can see today, virtual and physical stores seem to have an integrated relationship, which stimulates consumption. For example, consumers select products through the Internet, and receive discounts if they pick up the products from a physical store.

O2O Integrates Online and Physical Stores, Creating a New Consumer Experience

When O2O becomes an inevitable development trend, how should retailers integrate the advantages of the Internet into the physical channels? This is not as simple as merely setting up a shopping website. They have to think of a way to create a new consumer experience. Joy Chiu, senior manager of Advantech Service Automation Group, said that online shopping is very popular in China. Though the business of physical stores has been affected, they have not disappeared completely. It shows that there is still a purpose to their existence, as they provide consumers an environment in which to try the product personally.

In the traditional consumption experience, consumers can try the products that they are interested in. Today, with the application of information technology, the scope for consumers to try becomes more comprehensive and instant. For example, when a consumer picks up a ladies blouse and walks to a mirror, an RFID sensor on the front of the mirror can read the RFID tag on the blouse and display relevant information, such as the available colors, current inventory level, size, other products with similar designs, matching bottoms, etc. Consumers do not have to physically try items on to be able to see the overall effect.

Of course, apart from the capacity for virtual clothes fittings, other ways of creating a consumer experience include providing multiple shopping channels and creating comprehensive retailing (Omni-Channel).

Omni-Channel refers to allowing consumers to shop at any time and at any place, as well as to switch swiftly between different systems, and achieve an uninterrupted shopping experience. Chiu said another advantage of Omni-Channel development in the retail industry is that it gathers big data, and makes use of analysis to translate the data into usable information. It integrates data from different shopping platforms (such as tablet PCs and mobile phones) and channels (such as physical channels and shopping websites) and further identifies an individual's buying history, analyzes his or her preferences, and launches unique promotions, creating a unique, personalized shopping experience.

Recently, more retailers have been leveraging the advantages of online stores and physical stores to complement each other, creating higher revenue and proving the feasibility and infinite business opportunities of O2O. For example, UK's leading supermarket, Tesco, created an interesting and trendy O2O application in South Korea, and Tesco launched the first virtual grocery store, Home Plus, in a South Korean subway station. The digital advertising wall in the waiting hall displays various types of product photos. The public can make use of their waiting time to scan QR codes on the virtual shelves with their mobile phones, and then use the product photos on their phone to place orders. The customers then complete their payments through mobile banking. They may choose to collect the products from a store or request them to be delivered to their homes. Such a highly efficient and convenient shopping method has allowed Tesco to gain a wider customer base, expanding the market rapidly and efficiently.

In addition to O2O applications, IT management concepts were introduced to add value to retail operations and transform them, and this has become a big trend. Eugene Deng, former senior vice president of eFuture, said in this year's Advantech Intelligent Services retail application forum and partner.

conference that traditional retailing is moving toward the networked generation. Making use of IT for smooth operations transformation has become the key for physical stores to break through and to find room for growth under the impact of e-business. Deng took the international renowned coffee chain Starbucks as an example, and highlighted the fact that Starbucks is already a technology company instead of just a company selling coffee. In the Starbucks HQ in Seattle, there is a big display screen tracking discussions by North American consumers on Starbucks on social media platforms such as Twitter and Facebook at all times. The color immediately changes to red when unfavorable topics appear, to alert the service staff to rectify the issues as soon as possible. With such a monitoring system, it becomes easy to satisfy consumers. Starbucks' gold card users also receive SMS birthday wishes and two cups of coffee for free on their birthdays, which increases brand awareness and loyalty.

The business model of the retail industry is in the process of a paradigm change. In the past, IT investment was to reduce manpower and cost. Today, it is used to enhance the consumer experience and create revenue. Chiu emphasized that the consumer experience is an important key for intelligent retail development. The purpose of retailers bringing in IT equipment or even integrating different retail channels is to create a better consumer experience, and thereby to increase sales and service satisfaction. Such information can be accumulated and fed back to the retailers for big data analysis, with results applied to improving product quality and service.

China Retail Market Faces Big Challenge, Innovative Store Management Increases Competitiveness

Looking back at the China market, recent economic growth has led China to become the fastest country in terms of retail industry development, especially under the new urbanization policy. Chain store retailers promptly set up stores in the cities to be ready for the intelligent retail market. The overall retail market prospects look good. However, though the environment is good, challenges have also increased. As mentioned earlier, these challenges include how to develop an O2O integrated business model, how to enhance consumer experience, and how to apply big data analysis; these are issues that retailers have to consider.

Ming Chiang, General Manager of Advantech Intelligent Services China, believes that China retailers have to improve store management efficiency through IT. It is only by transforming from traditional retail to intelligent retailing can they increase competitiveness and overcome today's various challenges. In the past, most retailers did not put great importance on information technology. MIS was only for simple equipment maintenance such as managing network bandwidth, computers, etc. As O2O has become a trend, retailers have gradually realized the importance of IT. IT not only provides innovative consumption experiences but also increases the store's management efficiency. It is especially so with the increase in the number of stores and increasingly widespread distribution. Manpower alone is now unable to manage the load efficiently, and we have to rely on the assistance of IT.

Store management is normally categorized into two aspects, business and equipment. Business management refers to making use of IT to achieve intelligent retailing, which further improves business. Data-gathering application software is key for intelligent retailing. Examples include integrating video surveillance with intelligent image analysis, Real Time Location System (RTLS), kiosk, or integrating electronic signage with facial recognition for precision marketing, etc.

Chiang said that in most traditional methods, an equipment supplier provides a single piece of equipment for

systems integrators (SIs), who integrate equipment into the various systems. To assist SIs in reducing system integration time, Advantech has developed an innovative SRP model (Solution Ready Package, SRP), integrating a variety of intelligent retail application software with hardware to provide an overall intelligent retailing solution for the SI. The SI only needs to select the intelligent retail application software to be used, and install their own application software.

Lai further takes a POS system as an example to illustrate the benefits of SRP for SIs. He said that traditional POS equipment could only be used for settling bills, member management and warehouse management. Under intelligent retail development, POS functions have become more varied. For example, integration with video surveillance systems to carry out intelligent image analysis, or integration with digital signage backend management systems to concurrently manage customer bill settling and at the same time broadcast promotion information. Advantech has integrated such application software and intelligent image analysis software, digital signage backend management systems, etc., and SI providers need only to install their own POS software.

As for equipment management, IT is used to ensure the store's equipment can be operated normally. Most store staff members are not IT savvy, and when equipment problems occur, their first reaction is to call the IT staff. However, as China is geographically large, and counties are far away from each other, it is often impossible for the technical staff to be onsite promptly to repair equipment. For such situations, for equipment suppliers to be able to provide relevant assistance is very important. Advantech provides SUSIAccess management software, which is able to remotely monitor device status and provide for prompt repair. In addition, China has 64 service centers, and almost every county has a maintenance center, providing onsite service throughout the country, reducing the stress of IT staff in managing store equipment.

To summarize, Advantech's software and hardware solutions and service effectively help retailers increase their management efficiency, and cross from traditional retail to intelligent retailing. In terms of hardware, Advantech's SUSIAccess remote management software and onsite service throughout the country ensure normal operation of the various stores' equipment. As for software, there is different application software to assist retailers in implementing intelligent application or collecting data for big data analysis, and from there to finding methods to increase service quality and efficiency and reduce costs. □

Refining Customer Service

To improve service quality, banks in the Middle East have elected to enhance service quality by incorporating IT throughout the entire customer service process, performing branch performance analyses and assessing Big Data to improve service quality.

Writer | Liao, Pei-Chun
Interviewee | Allen Tsai , International Account Manager, iService Sector, Advantech

Banks are service businesses. Good services can often successfully retain customers. Traditionally, banks receive customers with a self-service slip kiosk near the front door. When a customer walks in, a bank employee responsible for reception asks them what business they wish to conduct, and issues them a number slip. The customer then waits until the number is called. Of course, not every bank has dedicated reception personnel and the customer may have to pick the number slip on their own. Regardless of which method, it is people-oriented. However, banks in the Middle Eastern countries have adopted IT-oriented, fully automatic customer reception.

Introduction of Information Technology Optimization Services

The oil reserves in some Middle East countries have created many wealthy tycoons. To retain these VIP customers, banks have done everything they can to improve the quality and efficiency of their services. Banks in the Middle East have always lacked a comprehensive index to evaluate the performance of each branch. Allen Tsai, Advantech International Account Manager, indicated that to resolve this problem, banks in Middle Eastern countries have introduced information technology optimization services, and adopted the UTC-515/520 developed by Advantech for kiosk self-services, along with 10-inch touchscreen PC UTC-101 tablets, and digital signage in combination with the relevant applications to enable customer reception process automation and improve customer satisfaction with bank services.

"Customer reception process automation" means a system that links the entire service process from customer entry to customer departure. Take the traditional customer reception process described above as an example. When customers arrive at the bank, an Internet webcam installed above the entrance door can automatically capture the facial images and perform facial recognition, and transmit the results to the back end to notify the bank that a certain valued customer has arrived at the bank so that a receptionist can go to greet the customer immediately. A customer will hear the receptionist's warm greetings, such as "Ms. X, would you like to make a deposit today?" as soon as she steps into the bank. Individualized greetings make the customers feel valued.

Tsai added that Middle Eastern countries issue a membership card to each customer with deposits. Therefore, some banks have elected to install sensors at the door. Customers only have to swipe their cards for the bank to confirm their identities. In addition, if a customer wants to conduct special transactions such as safe deposit box applications, financial consultations, etc., the customer can also make appointments with a dedicated person at the bank through a smartphone app or the bank website and avoid having to wait for a long time in the bank.

Next, the receptionist leads the customer to the self-service slip machine. In addition to issuing the numbered slip and supplying information such as exchange rates and interest rates on deposits, etc., the kiosk can also fill-out the relevant business-related electronic forms. For example, if the customer wants to process a bank deposit today, the customer can use the kiosk to fill-out the deposit form. After the form is filled out, the kiosk prints out the form and the customer then takes the deposit form and the number slip to the lobby to wait for their number to be called. For banking staff, electronic forms have the benefit of saving time because the kiosk can transmit the form to the back end so that the staff person only needs to retrieve the data in the computer instead of having to fill out the form again.

As customers wait in the lobby, the digital signage broadcasts different program contents based on the customers' identities in order to achieve the target audience marketing objectives. This is different from broadcasting the traditional fixed content (usually television programs and advertisements), and adopts a different approach. Tsai indicated that because the digital signage already has a built-in camera and smart image analysis software, it is able to automatically analyze the customers' data information such as gender or age. When there are people that fit a certain category (such as middle-aged men), the appropriate content for this group would be played. Finally, when the customer has completed their business, the counter window has a 7-inch to 10-inch UTC tablet PC that allows customers to perform satisfaction surveys.

Stable and Reliable Industrial Standard Computer Becomes Front Line of Customer Contact

During the entire customer service process, IT plays a key role to help banks to collect a significant amount of data such as the customer's ID, waiting time, and customer satisfaction level. These data are instantly transferred to the database for analysis or to output reports that facilitate the branch supervisor or headquarters managers in their review of performances and allotment of relevant rewards and penalties, or help them to find a way to improve the service quality. For example, when a branch supervisor reviews the weekly report, the supervisor may find that customer dissatisfaction for this week tended to be high. The supervisor can require staff to actively call the customers to find out why, and to do everything possible to improve the customers' impression of the bank.

In addition, the first line that faces the customers for this solution is the hardware equipment. Because there are numerous customers who visit the bank each day to process transactions, equipment must meet industrial standards and operate stably and reliably in order to withstand utilization by a significant number of people. The Advantech UTC series not only meets the customers' needs, Advantech also provides spare parts services to enable its customers to maintain operation without interruption.

Tsai further clarified that if the hardware has problems, the general practice adopted by the vendors is to ask the bank to mail back the device. The vendor then fixes the device and delivers it back to the bank. By the time the bank gets the device back, it is probably a week later. However, banks cannot interrupt their operations due to hardware malfunctions. The general practice no doubt creates a period where no service is possible. Therefore, Advantech decided to change its practice, and first provides a new device as replacement; this ensures that banks can maintain normal operations. A bank can ship the defective device for repairs after it has received the replacement, and then return the replacement after it has received the repaired device.

For banks in the Middle East, changes in customer reception have not only improved the quality of service, they have also enabled the banks to collect various data such as the average time for a bank personnel to provide services to a customer, the customers' satisfaction level, the customer waiting time, etc., and convert these data into performance indicators. At present, increasingly more banks have incorporated these systems, and other businesses as well have adopted them, including telecommunication retail stores, and government agencies. Tsai believes that this fully automated customer reception solution is suitable for any industry that provides services through counters. □

Desktop Cafe AutoPerk, an Innovative Customer Service Experience

System integrators in the United States have recently announced AutoPerk, a smart coffee machine integrated with an Advantech UTC-515 touch panel tablet computer. Offering a variety of coffee beverages, AutoPerk enables retail stores and service stations to improve operational efficiency and customer satisfaction.

Writer | Liao, Pei-Chun

Interviewee | Patrick Kuan, Business Development Manager, Digital Retail Sector, Advantech

After a month of staying late at work, Jack was pleased to have finally completed his project according to schedule. Before beginning the next project, Jack requested two days leave so he could take a short trip and enjoy some relaxation time. However, upon entering the freeway, Jack's car began to stall. For safety, Jack decided to exit the freeway and look for a vehicle maintenance and repair center.

While the car was being checked, a member of the service team led Jack to the customer lounge, saying,

"Sir, please wait here for a bit. Would you like some coffee?" "Yes," replied Jack, reclining on the sofa and contemplating closing his eyes and resting for a bit. However, the enthusiastic staff member pointed to a screen on the table and asked, "What type of coffee would you like? An Americano? Mocha? Or something else? Do you take cream and sugar?" Jack watched as the staff member softly tapped the screen a few times. Moments later, Jack was presented with a cup of steaming hot coffee. As the fragrant aroma of freshly brewed coffee wafted through the air, Jack felt his bad mood begin to dissipate.

The machine described above is the smart coffee machine AutoPerk, developed by the American system integrator Perk Dynamics. Many of the retail stores and service stations people visit regularly, such as repair/sales centers, telecommunications outlets, and banks, typically offer free drinks to enhance customer satisfaction. However, because store space is limited and employing staff specifically to prepare drinks is unfeasible, the choice of refreshments available is generally limited to coffee or tea.

AutoPerk is a coffee machine integrated with an Advantech UTC-515 touch tablet computer. By offering users the choice of various types of coffee, AutoPerk simulates the experience of drinking coffee in a cafe. Patrick Kuan, Advantech's Business Development Manager, likened the UTC-515 tablet to an automated barista that functions as the digital interface between customers and the coffee machine. Customers select a coffee beverage via the UTC-515 touchscreen; the UTC-515 then issues a command to the coffee machine to brew the coffee selected by the customer. Payment can also be completed using the UTC-515 interface.

The Unique System Design Integrates Peripheral Devices

The UTC-515 is designed with a track-like concave recess to facilitate the integration of various peripherals, such as magnetic

stripe readers (MSRs), 2D barcode readers, RFID sensors, webcams, and night vision device sensors. Enterprises can integrate these peripherals according to the system application models and needs to best serve the onsite environment and, thus, maximize benefits.

AutoPerk also features a 2D barcode reader that allows customers to scan coupons, as well as an MSR module that enables customers to make payments using a credit card. Regarding smart coffee machines installed at banks, a network camera designed for facial recognition can be integrated with the system to allow VIP customers to enjoy coffee free of charge. For smart coffee machines installed in staff lounge areas, the system can be equipped with RFID sensors that enable staff to pay for beverages by swiping their employee card; payment is deducted in points or from their salary.

Kuan stated that the concave recess of the UTC-515 ensures that peripheral devices are securely connected and not scattered around the machine. This design facilitates the maintenance of a clean and tidy system environment, and reduces the likelihood of users

touching the peripherals and accidentally causing a system failure. Furthermore, the unique mechanical design allows customers to determine the placement of peripherals. Similar devices currently available on the market do not offer this flexibility; the position of connected peripheral devices is generally fixed. For example, network cameras can only be placed at the top of the screen, and 2D barcode readers can only be placed at the bottom. Thus, for enterprises with different needs, additional time must be spent customizing such devices.

AutoPerk is Easy to Install and Increasing in Popularity

AutoPerk is easy to install, features a simple user interface, and can be installed in a variety of places where people gather. Currently, numerous casinos, hospitals, hotels, restaurants, office buildings, and stores in many countries worldwide are extremely interested in installing AutoPerk machines.

For both the retail and service industries, smart coffee machines can enhance customer satisfaction through the provision of a wide range of coffee beverages. Such machines can also be a tool for rapidly establishing close customer relationships.

For example, when customers enter a store or service center, sales personnel can use the offer of coffee to relax them before promoting products. From an industry perspective, AutoPerk enables coffee retailers to cost-effectively expand their product channels and cooperation with specific brands by, for example, establishing a local "Coffee Day," where people can receive a free cup of coffee when they spend a certain amount of money at a particular store. Furthermore, the adoption of customer self-service strategies in the food and beverage industry can increase operational efficiency and reduce unnecessary waste.

Technology applications should enhance people's quality of life. AutoPerk functions as a mini desktop cafe that offers a diverse selection of coffee beverages to increase customer satisfaction and store loyalty. □

Power Q Queuing System
Takes the Pain Out of Waiting

Advantech launched the Power Q queuing system, utilizing IT instead of manpower for calling the numbers of customers waiting in line, thus serving to address the issues related to large crowds during meal times. With this solution, customers no longer need to waste time waiting in line, which naturally improves the level of customer satisfaction.

Writer | Liao, Pei-Chun

Interviewee | Wesley Liu, Business Development Manager, Advantech Intelligent Services China

Modern society is quite busy, and enjoying delicious cuisine has become a convenient way for people to relieve pressure. But this sometimes leads to customers having to wait in long lines at restaurants during meal time, especial during the weekends or holidays. Although waiting lines can indicate popularity, this experience often generates negative feelings in the customers and discourages other people from wanting to dine at that restaurant. For restaurant operators, long lines may cause negative impacts such as disorder or declines in service satisfaction levels.

Power Q Turns into a Front-line Customer Service Assistant

A famous Taiwanese dumpling house used to be frustrated by the problem of long customer lines. Since the dining space of the restaurant could not accommodate a large number of customers, long queues with too many people blocked aisles and passageways, and also caused the restaurant to lose customers. Some customers were tourists who would take a glance at the queues and go dine somewhere else.

To resolve the problem of long queues, Advantech launched PowerQ Queuing System, which comprises three parts: the kiosk self-service machine based on Advantech UTC-520, digital signage to broadcast the queueing status, and calling management software. Wesley Liu, Business Development Manager of Advantech Intelligent Retail Services, indicated that a customer only needs to enter the number of diners into the kiosk and choose whether to leave a mobile phone number, and the customer is given a ticket with queue number, number of guests, and a two-dimensional barcode.

Subsequently, the customer only needs to scan the two-dimensional barcode and connect to the cloud server to see the current number being called. If the customer has left a mobile phone number, the system can also issue a text message when the customer's number is close. This way, customers do not need to wait in front of the restaurant for their turn, and can go shopping nearby or do other things to pass the time. They only need to return to the restaurant when the text message is received.

In addition, the queuing system is useful to the staff. The system automatically assigns an appropriate table type based on the number of diners in the party. For example, if three people are dining, a table for four will be assigned. The console then displays the current waiting line number based on the table type. A phone icon behind the number means that the customer has left a mobile phone number. Liu indicated that the system can issue a text message to the customer based on the advance notice setting configured by the restaurant. For example, if a customer is notified five numbers ahead of time, the restaurant staff can make a record of whether the customer showed up or not. This method replaces the traditional method where a restaurant staff member would have to call and notify customers one at a time, or use paper to record whether a waiting customer has returned to the restaurant. The new method reduces the operating time and improves efficiency.

Integrating On-site Queuing and Booking Reservation Information

In addition to managing the customers queuing on-site, PowerQ has also integrated the information from the booking reservation system with the queuing number system. Because the system already has a built-in reservation booking menu that records options such as the number of people dining, dining time, contact number, whether a baby seat is needed, and other special requests, when a staff member receives a phone call for reservation, the staff member only needs to select the options in the menu, and then import the reservation data from the online system or smartphone app into the queuing system. This enables the entrance receptionist to easily handle customer related issues.

Liu also indicated that restaurants record their customer reservation information mostly in notebooks, and must waste time looking for the information in the notebook when a customer cancels or arrives for the reservation. If a restaurant adopts Internet reservations, the restaurant must print out the reservation information

and the receptionist must look at two pieces of information simultaneously, which can affect reception efficiency. By adopting PowerQ to resolve the waiting line problem, PowerQ can cover all of the front-line customer contact service items and thus naturally enhance work efficiency.

Liu believes that the restaurant owners enjoy four benefits after adopting the PowerQ queuing system: (1) Labor costs are saved by modifying the traditional reception working model, which requires one response for seat arrangement and the one for issuing queuing number. (2) Customer satisfaction is improved because customers no longer need to waste time queuing on-site. (3) During non-peak dining hours, the kiosk can display special-offer messages with animations, videos, etc. These messages can be easily updated, which was impossible with the posters used in the past. (4) In the past, reservations were hand-written in notebooks. Now, they are automatically recorded in the system, which can analyze which customers are loyal patrons (customers with a higher frequency of booking reservations), and send them special-offer related messages in advance. This can test whether the special offer is attractive and increases return rate.

At present, there are two Power Q system architectures: one for stores and one for shopping malls. The store system architecture is similar to the solution adopted by the dumpling house described above. For the shopping mall solutions, waiting line data for numerous restaurants are transmitted to the mall-wide server, and instant messages are simultaneously displayed in areas where crowds gather. This category of solutions is suitable for department stores and shopping centers. Of course, the premise is that these restaurants have already adopted the PowerQ store solutions. The shopping mall solution uses 42-inch vertical kiosks that can be placed in public areas of the mall such as halls, escalators, or parking lots. They are used to display the waiting line numbers for the various restaurants, how many sets of customers are waiting, and directly print out waiting number slips for specific restaurants. Customers do not need to wait directly in front of the restaurant and can spend the time shopping, which stimulates consumption and enhances revenue for the shopping mall.

PowerQ has integrated cloud computing, touch panels, digital signage, and smartphone app technologies, and manages queuing more efficiently as well as providing better consumer experiences. With PowerQ, the restaurants and the mall operators can improve their customer satisfaction and loyalty levels, further improving revenue. In this case, appropriate technology has created a situation to everyone's benefit. □

Transforming Shopping Centers into "Smart Malls" Using POS and Kiosk Solutions

Faced with growing pressure from online competition, malls and department stores are actively looking for ways to retain their customers, and information technology is the best method to do so. The Global Mall in Taiwan and department stores in many countries have used POS and Kiosk solutions from AdvanPOS to improve shopping experiences and provide customers with higher quality services.

Writer | Liao, Pei-Chun

Interviewee | David Tseng, Sales Manager, AdvanPOS ; Partrick Kuan, Business Development Manager, Digital Retail Sector, Advantech

With the increasing popularity of e-commerce, traditional brick-and-mortar stores are finding their revenue streams under increasing attack, a fact which is especially true for malls and department stores. In order to attract more customers, department stores must more heavily utilize promotional events to increase sales and introduce various types of IT equipment to improve customer shopping experiences. For example, Taiwan Global Mall uses POS systems to improve its sales efficiency, and some department stores have used AdvanPOS Kiosks to integrate online shopping with the physical sales channels.

Taiwan Global Mall started needed a POS system with a secondary screen (customer display) that was able to turn 360 degrees. Because there were numerous cashier checkout counters of different sizes, a fully rotating secondary screen would enable multiple purpose usage; for example, the main and secondary screens could both be utilized as digital signage displays. In other words, if a cashier's counter was not being used, the main and secondary screens could both face the direction of customers to display promotional messages, new products, advertisements and other shopping information. When the counter needed to be used again, the secondary screen could easily be switched back again to show transaction information.

After carefully assessing the market, the Taiwan Global Mall eventually selected the AdvanPOS Z-POS Lite system primarily because AdvanPOS products have flexible design features and can satisfy the demand to customize the secondary screen to turn 360 degrees. At present, the Zhonghe, Banqiao, Pingtung, Zuoying, and Hsinchu World Expo branch stores have incorporated over 1000 AdvanPOS Z-POS Lite units. In the future, the company would expand them to the Hsinchu Cultural and Creative Museum as well as Linkou branch stores.

Dual-Purpose Machine: POS Terminal and Electronic Display

AdvanPOS Sales Manager David Tseng indicated that when department stores select POS systems, their top priorities are operational stability and styling. Z-POS Lite offers an aesthetic appearance and industrial specifications that perfectly fit the needs of the Taiwan Global Mall.

Z-POS Lite has a fanless design that makes it noise-proof and dust-proof, can prevent vent clogging and overheating risk, and has enhanced operational stability. In addition, the main and secondary screens are both touch panels and have black aluminum alloy chassis. Not only does the exterior have an elegant design, the material can resist wear and tear after long-term use and maintain its stylish outlook. In addition, Z-POS Lite has a 15" inch main and secondary screen that can display checkout information in more detail, including product names or transaction amounts, unlike previous POS systems that could only display transaction amounts due to their smaller screen sizes.

Throughout the entire integration process, the biggest challenge is time. First the Taiwan Global Mall hopes to complete system integration within one month. Therefore, the project team was given a challenge to resolve time issues, develop a customized design

product sample that complies with the customer's demands within 10 days, and complete the shipment operation within one month. The second challenge was installation. The department stores' operations cannot be interrupted and the shoppers cannot be affected by the POS installation, so the installation must only be executed in the short 12 to 13 hours between the end of a work day and the start of the following work day. To improve construction efficiency, the AdvanPOS team conducted extensive hardware and software tests prior to installation in order to prevent the installation from extending into work hours the following day. As a result, installation for over 200 POS units were completed in one short night.

Taiwan Global Mall believes that Z-POS Lite offers four major advantages: (1) The product is well-designed and has an aesthetically pleasing appearance which is consistent with the image they want to give to customers. (2) The bezel-free monitor design makes it difficult for the product to accumulate dust. This is in stark contrast to traditional white plastic POS systems used in the past, which quickly became dirty and give a bad impression to customers. (3) Maintenance is simple, and disassembly and replacement of components is fast and easy. (4) Excellent service and support. AdvanPOS offers spare parts and the software vendor provides onsite service at department stores so any problems can be resolved quickly.

AdvanPOS Kiosk Combines Online and Physical Shopping Experiences

Most traditional retailers around the world have had to develop online shopping platforms, and department stores have felt the pressure from online retailers. To meet these challenges, department stores have utilized AdvanPOS Kiosks to integrate online shopping features with their physical channels to achieve an Online-to-Offline presence to boost sales.

Partrick Kuan, Business Development Manager, Digital Retail Sector, Advantech, described an issue which often affects the shopping model of traditional department stores as follows: when a shopper sees a pair of shoes

that they like but discover that the size does not fit and the store does not have their size, the customer has two choices: (1) wait until they re-order the right size from another branch and return at a later date; or (2) take their business elsewhere and shop at another shoe store. However, by utilizing the self-service AdvanPOS Kiosk, a department store somewhere else could provide the customer with a third option: they could simply scan the product barcode of the shoes they wanted at the AdvanPOS Kiosk, select her size, make the purchase, and then have the shoes delivered directly to their home.

In addition to displaying all product sizes, AdvanPOS Kiosks can also show different colors of the same brands for the customers to select from. Because physical stores have limited spaces, all their stock can be showcased through AdvanPOS Kiosks. Customers can tangibly feel the materials or try on cloths while browsing for other products at the checkout counters, and perform the checkout process using AdvanPOS Kiosk for confirmed purchases. This integrates the online and physical product purchasing features.

This particular AdvanPOS Kiosk is based on the Advantech UTC platform and provides functions such as floor query/introduction, store directory, sales event promotion, and online/offline sales integration that are posted in a lobby or checkout areas for products with the same attributes (such as women's shoes or cosmetics products). These functions are suitable for customers who do not want to be bothered by sales assistants.

Partrick Guan further indicated that Advantech attaches great importance to customer needs. If an original product cannot fully satisfy the customer's requirements, Advantech can work with customers to fully customize the product in order to meet specific demands. For example, the original UTC notch design can accommodate numerous peripheral expansions, but when one department store had misgivings about the notches at the four sides of the screen not being aesthetically pleasing, Advantech completely redesigned all of the peripheral equipment and eliminated all of the notches, leaving only the MSR/RFID reader protruding slightly to facilitate card swiping by customers.

As competition becomes increasingly heated in the retail industry, department stores and malls must seek to provide better shopping experiences to customers in addition to searching for innovative services and marketing practices, reducing costs, and improving operating efficiency. The integration of POS and electronic displays gives department stores another sales marketing channel without requiring the purchase of additional equipment. In addition, the online virtual library stored in AdvanPOS Kiosk can reduce clutter and free up more retail space, allowing stores to put more merchandise on display and offer customers more comfortable shopping spaces. □

Smart Analysis of Big Data is Key to Enhancing Retail Competitiveness

Retailers must enhance store management efficiency to optimize the shopping experience and attract more customers—and Big Data analysis is one of the best methods to achieve these objectives.

Writer | Liao, Pei-Chun

Interviewee | Wesley Liu, Business Development Manager, Advantech Intelligent Services China

Due to increasingly heated competition, retailers must enhance user shopping experience in order to attract and hold new customers, increase customer bases, and increase spending. Retailers can also improve store management efficiency and smart IT services to lower labor costs, and Big Data analysis is one of the best methods to achieve these objectives.

There is a wide range of retail categories, and each category has different features and needs. For example, department stores and clothing stores are both parts of the retail industry, but their scope and customer attributes are vastly different. As a result, their Big Data analysis needs are also different. At present, Advantech has developed appropriate Big Data analysis recommendations for the following four most-common retail industries: retail chains, shopping malls/department stores, restaurants and services, and hypermarkets/supermarkets.

Providing Different Smart Analysis Recommendations for the Four Major Retail Types

n terms of the chain retail industry, the most appropriate data analysis includes "customer flow analysis", "advertisement video group analysis", and "device management". Wesley Liu, Business Development Manager of Advantech Intelligent Services China, indicated that "customer flow analysis" means customer flow statistics for each period as well as the customers' ages and gender related data. The objective is to determine what products should be displayed in which stores at which times and seasons in order to

attract more customers, or to analyze which spots are optimal for displaying which products. In the past, all store bases imported the same goods, and they were furnished the same way as well. Today, these aspects are flexibly adjusted. For example, convenience stores near offices should display more cooked foods to make it convenient to resolve meal problems.

"Advertising video mass analysis" means installing cameras on top of the digital signage that plays promotional videos to analyze the age and gender related data of the shoppers who have stopped by, break down a 60-second advertisement into 60 frames, and look at the characteristics of each person who looked at the frames to analyze whether the video playing time is correct and whether the advertisement is successful in order to optimize the advertisement content.

In terms of "equipment management", the Advantech SUSIAccess software can be used to monitor device operating status remotely and the UStore Manager (USM) can instantly monitor the chain store environment. The USM installs a variety of sensors inside stores to monitor electricity consumption, freezer temperatures, carbon dioxide concentration, whether the freezer door is closed, etc.; and transmits this data back to headquarters. USM allows managers at headquarters to discover any anomalies in the stores instantly. For example, suppose a certain store shows a dramatically higher oven electricity usage than that of other stores; it is possible that the oven may be malfunctioning, and headed for a breakdown. Hence, the store manager can, if needed, arrange for repair in advance to ensure the normal, steady operation of the device.

As for shopping malls and department stores, in addition to the various analysis modes discussed above, the RTLS indoor positioning technology can also be applied to manage VIP customers' consumption lines or combine with mobile phone apps to implement promotions. For example, when a customer comes near a certain sales counter, targeted promotional messages from the checkout counter can be pushed to the

customer's mobile phone. Liu indicated that at present, the RTLS indoor positioning primary uses the Wi-Fi or Bluetooth messaging protocol, so the positioning accuracy is based on the number of the wireless APs and installation density. Normally, positioning using Wi-Fi is more likely to succeed because people often turn off their Bluetooth or wireless communications in order to save power. Department stores may offer free Wi-Fi as an incentive and attract customers to turn on Wi-Fi and connect to the Internet.

The dining and services industries can perform Big Data analyses using the Advantech PowerQ queuing system. PowerQ's interfaces are divided into customer end and store personnel end. The primary functions at the customer end is to issue number slips to customers and send notification messages when their numbers are about to come up. For the store personnel end, PowerQ alerts personnel to which waiting numbers have been messaged and records whether the customers for those numbers have been seated or not. PowerQ can analyze data such as lengths of customer wait times, how many people get wait slips each day, the waiting time for each number (customer group), and how many numbers have given up because their wait time was too long.

In addition, PowerQ can also combine with the POS sales data to identify payment times, payment amounts, and meal contents as well as to conduct further cross analysis. If, for example, cross analysis reveals that the table turnover rate is low during peak hours, slow dish preparation may be the cause, and the restaurant should deploy more staff or provide meals with shorter prep times.

Finally, the hypermarkets/supermarkets can use the Advantech WebAccess+IVS intelligent image analysis software to meet their needs. Liu indicated that the application uses the POS function to operate intelligent image analysis software and perform image analysis, overlay, and gathering. When the POS cash register is opened, the system automatically captures video surveillance images for 10 seconds before and after the event, and then payment information is turned into text and overlaid onto the image. This information includes the product type and price, amount paid by the customer and change given by staff, the name and/or ID number of the staff, and the invoice number. In the event of a transaction dispute or suspected fraud by an employee, the owner can quickly search for the transaction images using specific search strings, rather than being limited to searching by date as in the current system. The targeted transaction can be found in moments.

Tailor Made to Optimize Competitive Advantage

Liu indicated that the Big Data analysis models listed by Advantech are based on those commonly utilized in the retail industry. However, retailers can also make specific changes according to their needs.
For example, a certain supermarket in China has statistics on how many people enter the store per minute and they compare this data with POS checkout times to determine the average amount of time customers stay inside the store. In addition, cameras are installed above the main aisles that analyze the ratio of left and right turns made by customers in order to optimize the store's merchandise layout.

In short, there are great opportunities for retailers to establish customer information acquisition and analysis capabilities as quickly as possible. The more complete the information acquisition and analysis capabilities, the easier it is for stores to carve out an advantage in the market and maintain competitiveness in the marketplace. □
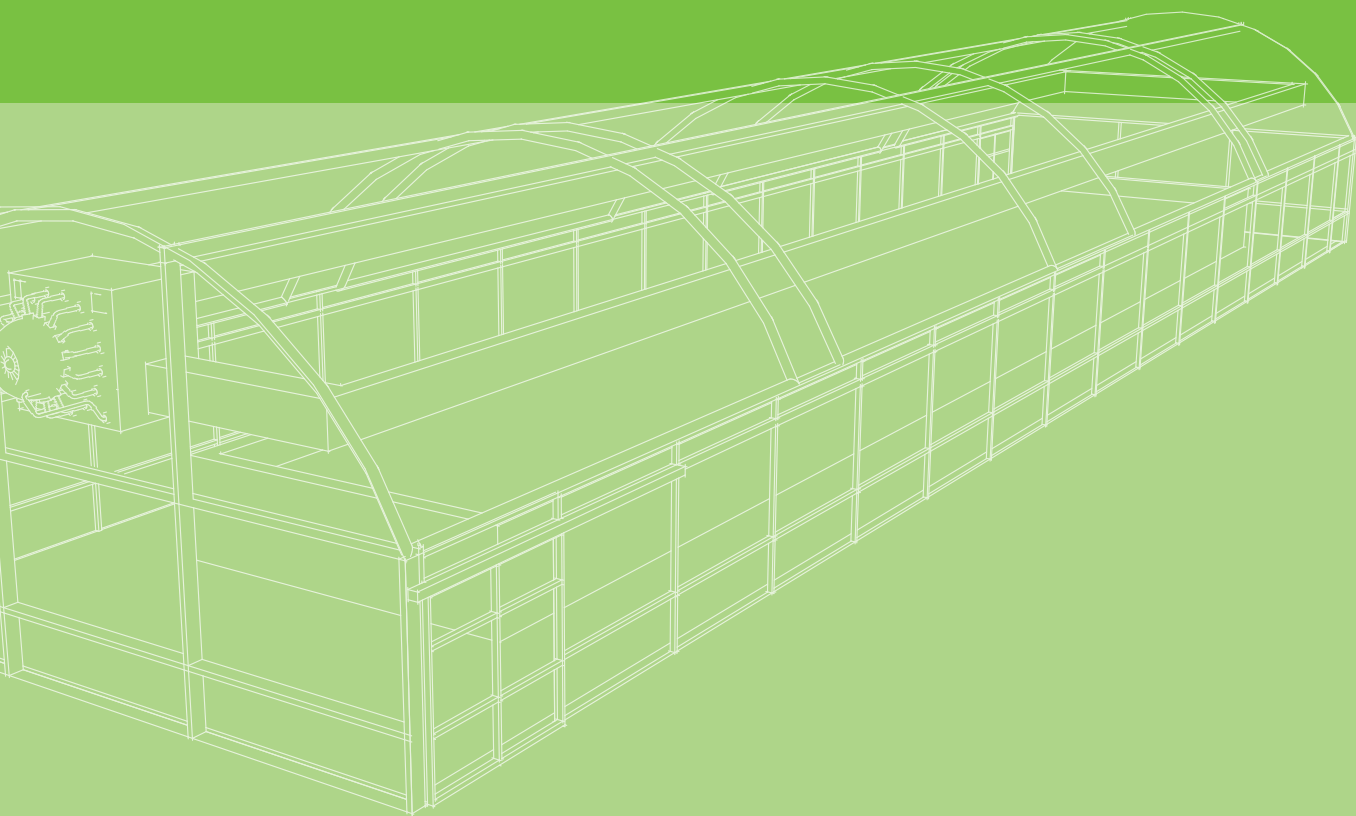
Application Story

Intelligent Agriculture & Environmental Monitoring

- ‣ Intelligent Greenhouses
- ‣ Intelligent Plant Factories
- ‣ Intelligent Environmental Monitoring

Intelligent Agriculture Drives the Green Economy

Intelligent agriculture constructed from the Internet of things (IoT) can increase agricultural efficiency, enable the integration of technology in traditional agricultural developments, and provide a path to modern agriculture. By driving the development of related industries, intelligent agriculture also encourages economic synergy and the expansion of domestic markets.

Writer | Xiao-Jing Yu

Interviewee | Allan.Tsay, Associate Vice President, iAutomation, Sector, Advantech China

A country is comprised of its people, and people depend on food." The availability of food is not only essential for maintain life, but also affects the social stability, harmony, and economic development of a country. In recent years, the price of food has risen continuously, and issues such as population growth and land degradation have resulted in losses of arable land. Additionally, crop failures caused by climate anomalies have become increasingly widespread. Relevant experts have also expressed concerns that global food supplies may undergo an unexpected crisis in the near future.

The recent report by the Consultative Group on International Agricultural Research indicates that the global food crisis is expected to intensify in the next 40 years. Fierce international competition for food has prompted various governments to explore overseas markets and increase domestic self-sufficiency to avoid the problems related to food supply shortages.

Despite a long history of agriculture, China is not immune to this global development. Millions of farmers are limited to farming and producing crops on only 9% of the world's arable land. In addition, the frequent droughts and natural disasters experienced recently have severely impacted local crop growth and harvest yields. Accordingly, since China's reform and opening up, at the beginning of each year, relevant authorities have published a policy document dubbed the "No. 1 Central Document" on agriculture, farming villages, and farmers. This document demonstrates the central government's emphasis on the complexities of developing farming villages and sets the tone for China's agricultural growth. For many years, the policy advice has incorporated the latest technology concepts to provide the technological tools for agriculture and promote the integration of agriculture and technology, the mechanization of labor processes, and the inclusion of information technology in agricultural production and management objectives. China's central authority also expects to utilize technological innovations to establish high-yield, high-quality, efficient, safe, and modern agricultural systems.

Integrating Intelligent Applications for Superior Agricultural Modernization

Regarding the acceleration of agricultural modernization, Allan Tsay, Associate Vice President of Advantech iAutomation Greater China Sector, indicated that among the many scientific applications, intelligent agriculture constructed using IoT applications is crucial for prosperous farming villages and sustainable operations. He stated that, "By implementing environmental monitoring and automatic control through the use of sensors, networks, cloud computing, and other advanced technologies, governments can increase agricultural efficiency and develop traditional agriculture into modern technology-based agriculture. Intelligent agriculture concepts can be applied to not only whole grain, fruit, vegetables, and flower crops, but also livestock and aquaculture. Such concepts offer various advance protection measures through the inclusion of real-time energy management systems (EMSs), thereby reducing the risk of infection among livestock."

Although most intelligent applications in the agriculture, fishery, and livestock industries are still in the promotion and advocacy stages, dozens of successful implementations have been achieved in recent years under Advantech's industrial automation platform. Furthermore, in many cities and towns in China and Taiwan, transition assistance has been

provided to experimental breeding and cultivation units, farmers and fishermen specializing in high-value agricultural products, and major electronics manufacturers intending to invest in agricultural production. For example, Advantech developed an IoT-based advanced automated production system for seed breeding and cultivation, production, marketing, and maintenance to create smart greenhouses that provide the optimal environment for crop growth throughout northern China and various regions of Taiwan. These smart greenhouses incorporate data analysis and processing capabilities as well as fault monitoring alarms to enhance grain drying, and feature IoT-based agriculture grain monitoring systems to prevent human error. Advantech rapidly constructed an innovative modern aquaculture monitoring system using wireless sensing technology in Penghu, developed a redundant monitoring system to ensure an uninterrupted supply of seawater for farming areas in Pingtung, used wireless monitoring solutions to enable stable operation and data collection at a plant factory laboratory in Guangzhou, and established LED plant factories, where plants can be harvested all year round throughout, in disused electronics manufacturing factories.

Crop Yields Increased Using New Technologies

Considering these successful applications, Tsay noted that with monitorable environments and controllable quality, intelligent agriculture has altered farming operations and management models and improved pest and disease control. This enhanced control and management also increases the yield and quality of agricultural products.

Tsai further stated that, "A vegetable farmer who adopted Advantech's solution was able to reduce the crop planting and harvesting time by 50%. The farmer is extremely happy because this enables him to double the potential yield of a specific amount of time. Additionally, a specialist orchid grower/exporter has increased the market value of their flowers because of their ability to adjust the temperature and humidity inside the greenhouses using automatic control functions. Convenient management through remote monitoring also enables farmers to monitor greenhouse data and optimize the crop growth environment via a mobile phone, tablet PC, or desktop computer connected to the Internet, without the need for field patrols."

However, the introduction of new technology typically involves a difficult adjustment phase, with users often exhibiting a "why bother" mindset. As highlighted by Tsay, Advantech's extensive experience enables us to provide the most appropriate solution for different applications, such as constructing a network for greenhouses and large fields using a complementary mix of wired and wireless devices, to resolve the issue of inadequate network communications. Traditional greenhouses can also be converted into smart greenhouses, and cryptic data can be presented in user-friendly graphs or charts. Considering the many cases that have yielded outstanding results, farmers can confidently adopt these new technologies to increase their agricultural output.

Agriculture Upgrades are Imperative for Economic Synergy

An increasing number of second-generation farmers are expressing willingness to adopt technological products, and numerous technology giants have made investments in the agriculture industry. Supported and promoted by the governments of several countries, relevant IT hardware and software technologies are ready for deployment, and the development of intelligent agriculture is expected to attract substantial attention in the future.

Intelligent agriculture can also create unexpected economic synergy. The software and hardware required for industrial upgrades, as well as warehousing, logistics, transportation, and online shopping applications will undoubtedly prompt the development of various industries, such as the technology and e-commerce industries, and subsequently expand domestic market economies. As highlighted by Tsay, "Intelligent agriculture is extremely meaningful for governments, farmers, relevant industries, and even the public. □

Using Smart Environmental Controls to Construct a Secure City Perimeter

The Internet of Things and Big Data technologies have matured to the point where they effectively assist managers in performing better environment and equipment monitoring, thereby enhancing disaster prevention and resilience as well as ensuring public safety.

Writer | Xiao-Jing Yu
Interviewee | Allan Tsay, Associate Vice President, iAutomation, Sector, Advantech China

In recent decades, global warming and climate changes have caused heavy rains, floods, heat waves, wildfires, typhoons, hurricanes and other natural disasters worldwide. Studies presented by the Intergovernmental Panel on Climate Change (IPCC) indicated that extreme weather events will continue to cause financial and economic losses and social turbulence throughout the world, as a result of phenomena such as the increasing number of floods, increasingly more powerful tropical cyclones, water shortages caused by droughts, and crop failures. These phenomena have irreversible impacts on the natural environment and significantly affect people's lives. Severe instances can even cause harm to the public health or force residents to leave their homes.

Preventive Measures Save Much After-event Repair

Not too long ago, most people believed that natural disasters were part of nature and could not be controlled. As a result, people simply adopted an attitude of enduring in silence when sudden suffering befell them. Although current cutting edge technologies are not yet able to change the occurrence of natural disasters, they can be used to take preventive measures or provide advanced warnings. Allan Tsay, Associate Vice President of Advantech iAutomation Greater China Sector, stated that, "In the past, people didn't have timely information on whether their environments would suddenly change, or if their equipment would break, or whether their facilities were operating correctly. This meant that both government officials and business owners basically went to sleep every night holding a ticking time bomb. When they woke up, they might discover that a bridge had collapsed, a sink hole had appeared, a mudslide had occurred, or a building had burned down. And then they would need to passively accept blame from other parties and execute the repairs for things that they could not prevent. Fortunately, the maturing Internet of Things (IoT) and Big Data technologies can effectively assist managers to better monitor their environments and equipment, thereby enhancing disaster prevention resilience and ensuring public safety."

How do these long-standing monitoring applications provide more thorough environmental and equipment monitoring after applying IoT technology and Environmental Facility Monitoring Systems (EFMS)? Tsay explained that in the past, data used to be collected from just a few locations, and it was difficult to achieve comprehensive and complete data analysis from the very limited sampling points. However, the comprehensive detection, reliable transmission, and smart processing platform promoted under the IoT can collect dynamic environmental and equipment data continuously through various terminal devices. Then network communications are used to transmit the live pictures or statistical data to the control center in the most expedient manner. The objective is to connect all the sampling points into a comprehensive network. The data can then assist the decision makers in formulating the proper plans in advance and making the correct judgments at key moments should threatening situations occur.

Tsay gave an example. "Beijing has increased the number of air quality monitoring stations several-fold compared to the past. They can detect concentrations of fine (PM2.5) suspended particles. These stations have continued to collect data at different heights in order to provide a better understanding of the sources of pollution. The stations instantly transmit the relevant information through the IoT, and because they are now better informed, people can take better protective measures against smog pollution."

Disaster Prevention Starts with Monitoring the Source

Because the EFMS covers a very wide range, it is generally
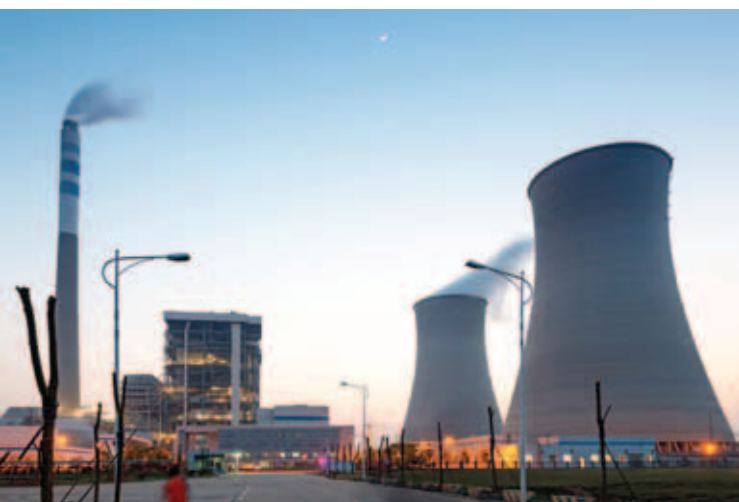
divided into two major parts, the Environment Monitoring System (EMS) and Facility Monitoring System (FMS), based on the different monitoring subjects and application objectives. The former focuses on water, air, ecology, radiation, and environment-related subjects; and the latter focuses on control for facilities related to public safety or building equipment.

However, regardless of whether it is regarding the environment or equipment, efforts to limit the scope of disasters or prevent problems from occurring must start from the source. Tsay said, "As the public's awareness of environmental protection increases, advanced prevention concepts have increasingly been taken seriously. Therefore, Advantech is able to integrate the relevant core components and software in various fields, such as water management, air quality, city construction, and power supplies in order to assist governments and private enterprises in building advanced monitoring systems that can perform rigorous checks."

In terms of city governance, only dams, reservoirs, and water plants performed hydrostatic monitoring in the past, which allowed them to maintain simple continuous water supply management. Now, however, these operations have been upgraded to ensure water use safety for the public. There is an automatic and continuous monitoring CEMS system, where sensors are installed in factory chimneys to prevent the manufacturers from discharging toxic emissions in a moment of convenience. The same applications can also be adopted for wastewater treatment to curb pollution from flowing into groundwater, rivers or oceans. For tunnels, bridges, highways, and other public facilities, around-the-clock video surveillance can improve people's driving safety. Rivers, lakes, pumping stations or sewers can be monitored to know when water levels are rising and provide early disaster prevention warnings.

In terms of business management, the IoT monitoring solutions provided by Advantech not only enable automated enterprise equipment operation, which

maximizes equipment efficiency, but its intelligent management system also provides real-time monitoring for enterprises that sell products around the country or have multinational offices or plants worldwide. This allows them to improve safety and save on energy, time, and labor.

Tsay used a generator manufacturer case as an example, and shared how the company has used Advantech's FMS to bring value-added benefits. Tsay stated, "Advantech's rugged hardware and WebAccess supervisory control and data acquisition enables users to monitor equipment status at any time, and automatically issues a warning message if an anomaly is discovered. Therefore equipment suppliers no longer have to wait until total equipment failure, then waste time and energy resolving customers' problems without knowing the cause of the failure. The advance prediction feature facilitates early maintenance. Not only did this function enhance the generator supplier's post-sales service quality, but it also improved the supplier's marketplace image from that of a traditional industry to that of an emerging technology company with innovative services."

Promise Us a Better Future

The pursuit of a better life is the common aspiration of all people. Despite the IPCC's frightening warning that "No one on Earth can be spared from the effects of climate change," Tsay believes that the pollution and problems that have caused the "uncontrollable" environmental changes as well as the environmental protection issues that can at any time endanger public health and safety can be prevented by adopting Advantech's comprehensive solutions, which integrate various core technologies as well as automation and information technologies. These solutions encompass whole environments through the Internet of Things, and are monitored through EFMS, thus implementing precautionary measures to minimize losses from disasters, while also improving policy satisfaction for governments and enhancing added value for enterprises.

In addition, Advantech has already accumulated over three decades of industry experience and countless successful cases. Advantech will continue to cooperate with industry and academia in hopes of jointly promoting this wave of intelligent applications for innovative technology in order to do its part in promoting social harmony and stability as well as the sustainable developments of cities. □

Transcending Traditional Production Models to Achieve High-Quality Yields

Intelligent Greenhouses Enable Farmers to Harvest Every Day

The management models enabled by intelligent greenhouses can reduce farming time and effort by optimizing plant growth environments. This allows farmers to produce high-quality crops and sufficient harvest yields to satisfy market demands. By transforming the season-dependent farming model of the past into an intelligent farming model, every day can be a harvest day.

Writer | Xiao-Jing Yu
Interviewee | Ellie Lin, Manager, DeNeng Scientific Research

Ms. Wang experiences mixed feelings when reading a news report about a world-famous champion flower grower. A few years prior, the flower grower suffered heavy losses from a devastating storm, which also scared away joint venture investors. However, the farmer refused to accept defeat and adopted the latest greenhouse technologies. He then carefully analyzed the temperature, humidity, lighting, and soil pH data collected using on-site sensors, making technical improvements based on this data. Eventually, the flower grower achieved the optimal growing environment for cultivating large, high-grade varieties of perfume lilies.

Intelligent greenhouses protect flowers from direct exposure to the external environment and enable consistent production of lilies in various colors. Additionally, flowering periods can be controlled according to the level of market demand; thus, a return can be made on every flower grown. Despite the fruitful results of the farmer's hard work, the yield quantity was barely able to satisfy market demand. Thus, the farmer was prompted to seek new locations for replicating the same intelligent greenhouse cultivation method to expand production and satisfy market demands.

From Weather-Dependent Planting to Intelligent Cultivation

Although the above narrative was fictional, the part about the flower grower's intelligent greenhouse is true. Ellie Lin, Manager of DeNeng Scientific Research (an affiliate of Advantech), was responsible for the project. She stated that, "The intelligent greenhouse solution provided can be used to record all farming processes, enabling farmers to identify the optimal cultivation conditions. This is crucial for farmers aiming to produce award-winning flowers. To satisfy the demands of domestic and foreign markets for various flower colors and fragrances, numerous species of flowers must be cultivated simultaneously. Thus, planting operations cannot be based on personal experience or intuition alone. The incorporation of technology can address deficiencies in manual farming by establishing a more precise cultivation method to effectively improve crop quality."

Greenhouses, also known as glass conservatories or nurseries, are buildings dedicated to plant cultivation. The design concept involves using electromagnetic radiation emitted by the sun to warm the plants, soil, and air inside the greenhouse. The greatest difference between a traditional greenhouse and an intelligent greenhouse is that traditional greenhouses only provide shelter from the outdoor environment to protect plants from natural disasters and reduce pest invasion. However, to maintain the greenhouse environment and care for the plants, a person must be assigned to patrol and monitor the greenhouse. By contrast, intelligent greenhouses can be configured to automatically activate sprinklers, shading nets, insulation curtains, circulation fans, etc. to ensure that the internal environment is consistently optimized for plant growth, saving farming time and effort.

Intelligent greenhouses constructed using technology developed for the Internet of Things also facilitate remote-management networking applications, where data is collected from various sites for processing at a central location. This enables farmers to monitor greenhouse conditions from any location. As an example, Lin described an "award-winning organic farm owner who took advantage of not only greenhouse technology, but also the benefits of the Internet and cloud computing by adopting a comprehensive greenhouse solution. Although this farmer owns

a substantial amount of farmland in Taiwan, he constructed an intelligent greenhouse in Fujian, China. Using the intelligent greenhouse solution, the farmer is not required to travel to China; instead, he can remotely control and manage the growth and harvest of crops from Taiwan.

Appropriate Technology Yields Substantial Benefits

Lin emphasized that investment costs are the main factor influencing farmers' desire to adopt intelligent applications, and selecting appropriate products is crucial for experiencing the full effectiveness of intelligent greenhouses. Issues such as how to ensure stable data transmissions in areas with poor network quality, whether the hardware can withstand high-temperature sterilization during fallow periods, and whether a new system can be integrated with the existing partially automatic devices can result in farmers wasting money without achieving the expected results.

Advantech's solutions enable high-end, European or American-grade products to be produced locally by providing farmers with a variety of wired and wireless network devices, wide-temperature computers with excellent heat dissipation for stable operation, converters that can be integrated with existing equipment, and intuitive software control platforms. Such products facilitate rapid and convenient construction of intelligent greenhouses. If crop quality and harvest time can be fully controlled, the traditional season-dependent farming model of "spring plowing, summer hoeing, autumn harvesting, and winter storing" can be transformed into an intelligent farming model, where every day is a harvest day. □

Planting Model Evolves Again to Reinvigorate Agriculture

LED Plant Factories Produce Harvest Miracles

Instead of the traditional method of planting crops on level soil, they now grow indoors in stacked, hydroponic vegetable factories. Thanks to comprehensive factory automation control operations, the traditional stereotype of farmers toiling in fields is changing, and more homogenized crops are being produced.

Writer | Xiao-Jing Yu
Interviewee | Ellie Lin, Manager, DeNeng Scientific Research

Amy, a journalist wearing protective clothing, a hair bag, and a surgical mask, is dressed to conduct a field interview at one of the most popular plant growing factories. After she enters the control gate, she does not see what most people would think of as a vegetable farm. Amy sees what looks like a high-tech clean room, with rows of three-dimensional cultivation frames; each divided into multiple layers and fitted with LED lights. Under the lights grow various hydroponic vegetables planted without any soil. These crops grow both pest, and pesticide, free.

Because every aspect of the plant environment is optimized by computer, the vegetables grow quickly and healthily. This cultivation process also guarantees that the vegetables are attractive to buyers. And by eliminating the need to allow for fallow field periods, the plant factory produces stable harvests year-round.

Breaking Through Traditional Farming Concepts to Create an Innovative Planting Model

Shen Lee, a poet in the Chinese Tang Dynasty, wrote the lines, "Till the land under the sweltering sun at noon, Nurture the soil with hardworking sweat". However, modern society is technologically advanced, and these outdoor farming practices can be replaced by other methods. Intelligent agriculture, driven by cutting-edge technology, can isolate the vegetable, fruit, and flower crops from the outside world and transcend the restrictions imposed by nature. Effectively controlled plant cultivation and production also enable crops to achieve the large yields and better quality.

Ellie Lin, Manager of DeNeng Scientific Research (an affiliate of Advantech), indicated that modern, intelligent agriculture is divided into two major categories. The first category is intelligent greenhouses. The second category is plant factories that employ

indoor environmental control in large buildings, such as warehouses or factories, and use energy-efficient LED artificial lights as well as soilless cultivation methods to cultivate fruits and vegetables. These LED plant factories have become more common in recent years, and they have also been actively promoted by governments in various nations. This is especially true for regions with limited arable lands or limited sunlight; they can take advantage of this planting method to achieve stable food supply production.

Comprehensive Automated Monitoring Mechanisms Guarantee Healthy Crops

This indoor farming method forgoes the traditional farming techniques that involve flat soil, and adopts a three-dimensional, hydroponic, crop planting system. However, although the indoor cultivation method can circumvent natural harms that affect crops grown outdoors, the indoor temperature, humidity, light source, carbon dioxide concentration, as well as the amount of nutrients in, and the quality of, the water supplied are critical factors that affect the health of the crops.

Lin indicated that the nutrient solutions, including pH, must be monitored very carefully for the hydroponic vegetables grown in indoor plant factories; nutrient concentrations that are too high or too low can be fatal to the plants. In addition, the indoor environment must also be maintained at an optimal state, or bacterial infections can develop under improper temperature or humidity, and can infect plants and kill them. If a sick plant is not discovered in time, it may infect others; in a severe case, it could destroy the entire crop. Therefore, it is critical to integrate sensors, automatic controls, data processing, network communications, and professional monitoring functions.

Take the hardware and software solutions provided by Advantech and DeNeng for example. Not only can the cloud architecture provide remote monitoring

and factory-style automated management, but the system can also collect and analyze data on indoor temperature, relative humidity, lighting, nutrient solution formulas, etc. The system must be able to issue an alert immediately if an anomaly is detected, automatically adjust nutrient solution formula ratios based on the crop's state of growth, and have energy monitoring management functions. Lin stated, "Not only can cultivators grow healthy vegetables without worries, but they can also invest more efforts into conducting studies on plant cultivation methods and nutrient solution formulations."

One-stop Production Line Management Ushers in a New Era for Agriculture

In addition to the automated indoor environment monitoring and management, DeNeng also expects that intelligent application integration will be required for the production, processing, packaging, distribution, and transportation aspects. Lin stated, "With the help of unmanned harvesting machines, conveyor belts, screening doors, RFID scanning, electronic scales, and other devices, the system can automatically identify, harvest, classify, weigh, and complete the packaging operations. This method can significantly reduce manpower costs and eliminate possible errors related to the manual data recording process. In addition, automated warehouse management can minimize the chances of bacterial contamination or impact damage for the produce, all the way from the farm to the dining table. This helps achieve product standardization and properly safeguards food safety."

DeNeng has also upheld the concept of "using technologically innovative farm management to achieve all possibilities for intelligent monitoring" as it promotes intelligent farming applications. DeNeng will continue to cooperate with the manufacturing sector, government departments, and academia to inject new energy into agriculture with technological applications, and help agriculture expand into a new era. □

New Generation Internet of Things in Environmental Facility Monitoring Systems

Environmental facility monitoring system applications in the past mostly adopted independent data and video monitoring applications and combined them into a complex system. At present, the new trend is to have one, single, integrated platform that enables customers to observe the environmental changes and take control of a variety of devices more conveniently. In addition, monitoring and management efficiencies can be improved when connections are made through the Internet of Things (IoT).

Writer | Xiao-Jing Yu

Interviewee | Winson Lu, Senior Manager, iAutomation Group, Advantech

Da-Ming, who works at a water monitoring center, watches the latest automated environment and facility monitoring system on the computer screen. He recalls how, in the past, staff had to be dispatched to personally patrol the various pump stations and test different pieces of equipment. As a result, he cannot help but admire the advancements in technology. Now he only has to press the start/stop or raise/lower keys on a computer in the main station to easily and remotely control operations. Da-Ming can also keep track of the site's conditions at any time by reviewing the real-time images collected from the digital cameras installed throughout dozens of substations.

In addition, the system can also provide 3D animations and realistic renditions of the geographic locations such as streets and rivers, and display them on screen. Da-Ming only needs to move his on-screen mouse cursor to instantly see the gates, water pumps, water levels, etc., for the area that he wants to monitor. The images are as real as if he had visited the sites personally. The rainy season approaches, and this system will be an outstanding helper in flood prevention work for the staff that needs to perform large-volume rain water

monitoring and management.

Single Integrated Platform Makes Maintenance More Efficient

Winson Lu, Senior Manager of Advantech iAutomation Group, indicated that environmental facility monitoring system applications in the past mostly adopted independent data and video monitoring applications and combined them into a complex system. At present, the trend is to have a single integrated platform that enables customers to observe the environmental changes more conveniently, and manage the relevant facilities more comprehensively and efficiently.

"In the past, due to underdeveloped networks and incomplete technologies, EFMS could only perform local monitoring and could not be fully networked. At present, thanks to the IoT, wide-area environmental monitoring equipment can be linked together with the IoT to enhance the management effectiveness of the EFMS," Lu said.

Take a simple building community application as an example. The personnel access management and the building environment CCTV surveillance system are usually divided and managed as two systems. If the building has a facility and energy management system, maintenance staff would need to learn yet another set of software and constantly switch between the different application systems. The different systems do not support each other and waste resources. There are also the problems associated with expansion when new features become available. Therefore, Lu believes that an integrated data and video monitoring system platform has the advantages of easy operation as well as simple maintenance management, and eliminates the issue of having to purchase multiple sets of software from different vendors. Therefore, the system can provide environment and equipment management in a more cost-efficient manner.

Lu further indicated, "In response to the IoT development trend, Advantech has developed a system

that enables one platform to simultaneously satisfy the aforementioned data collection, monitoring, and cross-platform display function requirements: WebAccess. After incorporating the video/audio functions, the management unit at headquarters can make the most appropriate strategic decisions with the help of accurate data and real-time videos. Through this, they can implement true remote monitoring." WebAccess provides a simple and easy to use platform for new projects, and additionally the system also provides a set of easy-to-integrate solutions for users with a variety of traditional old systems that have already been installed, and enables users to quickly and easily upgrade into a unified management system.

An EFMS Performance Maximization that Is Suitable for All Industries

At present, based on the EFMS application concepts, one popular setup for environment and facility monitoring involves the basic infrastructure and equipment being connected through the Internet and being controlled by management from the control center. This strategy is widely used in many industries, such as river dams, water supply and discharge, oil wells, renewable energy, industrial buildings, commercial office buildings, residential communities, and public facilities. Alert monitoring and management can also be used for specific targets such as pollution or hazardous sources, oil and gas pipelines, or telecommunication rooms. Lu gave some examples of successful cases that were completed with the assistance of Advantech, to demonstrate what users can gain by adopting the WebAccess platform and the EFMS.

Take the pump brake monitoring system in the Changing District of Shanghai as an example. The control center can perform automatic data collection; pump brake control, video surveillance, data exchange, flood control decision-making, information dissemination, etc., while simultaneously managing 14 pump stations and three rainfall water monitoring sites. The web-browser-based, client-side monitoring features enable engineers to conduct remote diagnosis and maintenance operations no matter where they are located. The embedded video software interface enables users to observe the pump and gate actions directly during pump gate control operations.

The centralized supply scheduling system constructed for the 19 water treatment plants in the suburbs of

Beijing is a remote monitoring system that enables users to obtain real-time water treatment operation data. This system not only has the remote pump gate monitoring system mentioned above, but it also has the remote site condition monitoring and maintenance function. Through the redundant communication design, the system provides high reliability and stability to ensure that accurate water quality data are provided in order to guarantee that the water stays safe for human consumption.

Oil field applications involve harsh outdoor environments, difficult installation, and difficult maintenance; Advantech's intelligent oil monitoring and management system provides the advantages of maximum equipment efficiency for high numbers of widely distributed oil wells with the help of production monitoring, energy management, and equipment management. The system's automation and stable equipment operation can minimize the number of workers needed, as well as reduce equipment maintenance time, and the equipment life-cycle extension is tantamount to a significant investment cost savings for the owners.

In addition, Advantech can also provide electrical equipment, air conditioning and water supply, access preservation, firefighting facilities, and smoke or water leakage monitoring systems for critical machinery rooms at enterprises or government agencies. Through data integration and remote image monitoring, managers can view instant engine room data and digital images simultaneously, or use voice communication to call the site or deter criminals who are attempting forced entry. WebAccess can also be partitioned to fully archive unmanned or small- to mid-sized machine rooms, and enable unified monitoring and management by a large machine room or control center. This system can save costs on manpower shifts or patrols, rapidly accelerate the fault reparation process, and use scientific management methods that can prevent major incidents.

Partial informatization and automation in the past have evolved into full Internet-based audio-visual technologies. Lu believes that the new environmental and facility monitoring systems can provide safe and secure environments, reduce staff workloads, and increase company management performance. As these types of intelligent systems are continuously being introduced to government agencies and different enterprises, scientific technology that can double the overall efficiency should be able to accelerate the industrial upgrade and assist the government agencies in conducting proper EMS and creating happy and harmonious societies for the public at large. □
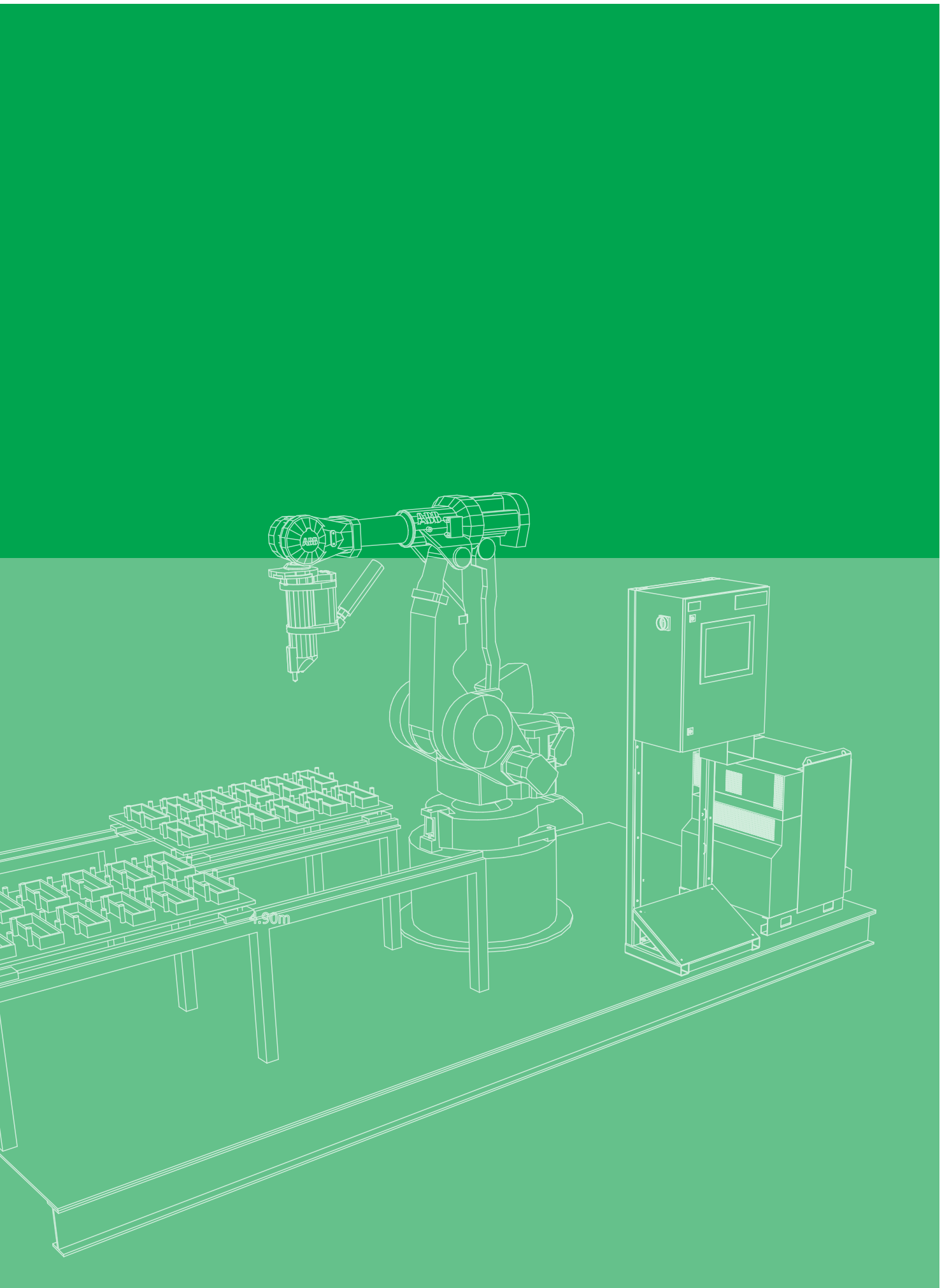
Intelligent Machine Automation & Robotics

- ▸ Industrial Robots

- ▸ Industrial Machinery

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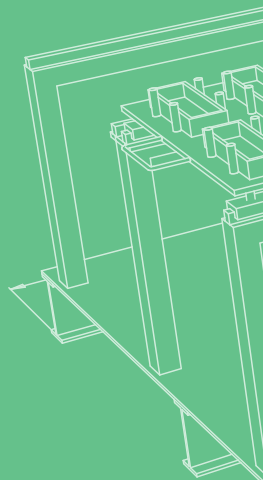
Smart Technology Triggers a Worldwide Manufacturing Revolution

The recent trend towards smart technology is prompting a paradigm shift in the global manufacturing industry. In anticipation of this development, many major industrial countries have made substantial investments to gain a market foothold amidst the wave of transformation.

Writer | Wanger

The 2010 collapse of the U.S. subprime mortgage market triggered a financial crisis that affected the entire world. After the crisis subsided, industries worldwide began to reassess global economic growth over the past decade. The tendency to "focus on finance while neglecting industry" was reversed, and the manufacturing industry once again became the developmental priority for many countries. Advancements in IT and automation technology accelerated around the world during this decade, enabling a new paradigm for revitalized industrial manufacturers. Many advanced countries have set smart manufacturing as the focus of national development and formulated relevant policies, for example, Industry 4.0 in Germany and the Advanced Manufacturing Partnership (AMP) in the United States. Despite the difference in name, the conceptual direction is consistent, in that both policies are aimed at enabling smart features in manufacturing systems, improving performance, and reducing cost through advancements in IT and automation technologies.

Germany, the United States, and Japan take the Lead; Large Manufacturers Remain Large

Examples of current national smart manufacturing development plans include the US's AMP program, South Korea's High-Class Advanced Technology National Plan (G-7), Germany's Industry 4.0, the European Union's ESPRIT, and Japan's Intelligent Manufacturing Systems (IMS) initiative. China, the country considered "the factory of the world," listed

the high-end manufacturing equipment industry as a strategic focus in its 12th Five-Year Plan, and aims to implement its Made in China 2025 plan shortly. China's objective is to transform itself into a global manufacturing powerhouse by 2025 and eventually overtake major manufacturing countries such as Germany, the United States, and Japan by 2035.

At present, Germany has the highest manufacturing industry to GDP ratio in the world. In 1991, the country's manufacturing industry accounted for 27% of GDP, declining to 23.1% in 2000. Despite falling continuously over the past two decades, Germany's manufacturing industry to GDP ratio still exceeds 20%. In addition, the manufacturing sector has consistently accounted for over 80% of Germany's total exports. This demonstrates Germany's emphasis on manufacturing, and provides a glimpse of its expectations for Industry 4.0.

Similar to Germany's Industry 4.0, the United States' AMP program combines the powers of industry, government, and academia. In February 2012, the U.S. Council of Advisors on Science and Technology published a report entitled "A National Strategic Plan for Advanced Manufacturing", which listed the following five main goals: (1) accelerate investment by small and medium-sized enterprises, (2) strengthen workforce skills, (3) establish public-private partnerships, (4) coordinate federal investment optimization, and (5) increase national investment in

advanced manufacturing R&D. The plan also outlined the strategies for achieving those goals. In March 2013, U.S. President Barack Obama announced that the United States would establish a National Network for Manufacturing Innovation. The objective is to setup 15 manufacturing innovation institutions nationwide within a decade, to serve as regional innovation and talent cultivation centers. This is expected to narrow the gap between basic research and industrial technology development.

China's "Made in China 2025" plan sets Germany, the United States, and Japan as its targets for good reason because these are the countries most capable of deploying smart manufacturing equipment. Reports by the research firm Gartner indicate that 74% of the world's 50 largest manufacturing companies are based in these three countries. The United States and Germany each have 13, and Japan has 11. Of the 10 largest manufacturing companies worldwide, five are American companies. Gartner's reports illustrate the technical strength of these industrial powerhouse countries.

China is a Crucial Player Enabling the Asian Market to Catch Up

Considering the current regional sales ratios in Asia, the three countries of Japan, Korea, and China exhibit the highest sales figures for computerized numerical control (CNC) machine tools, industrial robots, and smart control systems. According to a report by Wohlers Associates, in 2013, the number of industrial robots sold by these three countries was double that sold by European countries and 3.4 times higher than that sold by countries in North and South America. Regarding CNC machine tools, the total sales for Asia amounts to US$57.35 billion, which far exceeds the US$28.59 billion for Europe and US$5.83 billion for the Americas. According to another report published by Marketline, the compound growth rate of the Asia Pacific region for smart control systems is expected to reach 6.4% between 2013 and 2016, which is 2% higher than that for Europe and the Americas. These statistics indicate that Asia is the focus for worldwide smart manufacturing in the future, with China playing a key role.

In May 2012, the Ministry of Industry and Information Technology of the People's Republic of China officially announced its 12th Five-Year Development Plan with objectives for the high-end manufacturing industry, as well as the smart manufacturing equipment industry. This plan specifies the development goals of China's smart manufacturing equipment industry for 2015 through to 2020. By 2015, the sales revenue from China's smart manufacturing equipment industry is expected to reach RMB$1 trillion, with an average annual growth rate of at least 25%. By 2020, China expects to have established a comprehensive smart manufacturing equipment industry that generates over RMB$3 trillion in sales revenue. Therefore, over the next 5 to 10 years, China's smart manufacturing

industry is expected to undergo a phase of highly accelerated development.

Because China is predicted to be a key player in global smart manufacturing, manufacturers from various countries have made substantial investments to develop this market, with domestic manufacturers successively entering this industry as well. China's development of smart manufacturing technology began in 2000, which is relatively late compared to other countries. However, following 10 years of development, China has seemingly mastered the production of smart manufacturing technologies such as robotics, sensors, and controllers. Furthermore, the Chinese government has offered its full support and established first-class R&D centers in several key areas.

From "Made in China" to "Smartly Manufactured in China"

Overall, compared to other major manufacturing countries, a disparity still exists between China's basic smart manufacturing capabilities and its R&D investment. Additionally, China's capacity for original creation remains inadequate. Regarding equipment, China still relies on imports for core manufacturing components. Therefore, in addition to strengthening its R&D, overseas acquisitions should be a crucial part of China's current strategy for obtaining key enterprise technologies.

In terms of independent R&D, local governments in China have successively established smart manufacturing industrial parks in Ningbo, Wuhu, Tianjin, and Chongqing, to serve as development centers and promote regional industries. The industrial park in Ningbo emphasizes automation equipment and molding, producing 4000 machine units and 96,000 key components in 2013 for an output value of RMB$4.5 billion. In 2015, this park is expected to produce 10,000 machine units for an output value of at least RMB$10 billion. The industrial park in Wuhu was established after the Ningbo park at an initial investment of RMB$1.5 billion. The Wuhu industrial park is expected to produce 10,000 industrial robot units annually for a yearly output value of RMB$500 million. The seaside "smart manufacturing city" of Tianjin was designed and constructed to be the first high-end smart equipment strategic park in the Bohai Sea District to serve as model of smart manufacturing clusters in China.

In China, smart manufacturing efforts have been launched in both the public and private sectors. Although the development goals of public and private enterprises may differ, their advancement appears to be progressing. Thus far, several Chinese enterprises have benefited from the increased efficiency provided by smart manufacturing equipment. However, during this transition, China's public and private sectors should be further consolidated to facilitate the progression from "Made in China" to "Smartly Manufactured in China." □

Core Controllers Make Machines and Tools Smarter

Promoting Advanced Evolution in Manufacturing

The manufacturing fields responsible for processing and assembly are facing increasing challenges. As automated machine equipment is adopted for production lines, overall efficiency must improve in order to satisfy customer requirements. Intelligent industrial robots make processing machines smarter, and are the key to ensuring consistent product quality and on-schedule deliveries.

Writer | Xiao-Jing Yu
Interviewee | Michael Kuo, General Manager, Advantech LNC

Mr. Chen has a strong loyalty to a certain brand of smart phone, and their new model was recently released. He wanted to get his hands on the new phone immediately, to enjoy the "killer" features of the latest model. However, a whole month after the new model was released; he still could not buy the new model in retail stores. He thought that the manufacturer was deliberately restricting supplies in order to generate controversy and create a buying spree. However, he later found out from the news that the real cause of the shortage was the extreme complexity of the new mobile phone, which had led to increased difficulties for its assembly operations. Furthermore, the original manufacturer has strict product quality requirements. As a result, the production line could not ship enough product to satisfy the unexpectedly sudden market demand. As a fan of this company, Mr. Chen had no choice but to wait patiently until he could buy the new mobile phone.

Smart Equipment Improves Manufacturing Precision and Quality

The market's constant drive toward high specifications and quality has led original manufacturers to rack their brains to add innovative features to their products. They also need to shorten the product life cycles and launch new products in order to establish themselves in the highly competitive market. As a result, the manufacturers responsible for processing and assembly also face increasingly stringent challenges. Even if automated machinery and equipment are adopted on the production line, the overall effectiveness must further improve in order to satisfy customer demands. Michael Kuo, General Manager of Advantech LNC Corp., indicated that smarter machines, or so-called intelligent industrial robots, are key to ensuring consistent quality and on-schedule deliveries for products manufactured on production lines.

He explained that in the past, equipment suppliers would create the required automation equipment when a plant needed to produce a certain product. However, if the product features changed, the equipment often could not be upgraded or adjusted accordingly and the entire production line became useless. Moreover, advanced smart equipment has changed the rigid, one-command/one-action processing model mentioned above, and can be adjusted according to the new product requirements. It can even be precisely fine-tuned, and sensing devices installed to improve production efficiency. Because smarter machines can provide services to customers for different generations

of products, they also have an extended life cycle. The reduced depreciation/amortization costs also give the production equipment more value for money.

In comparison, manually operated machines are vulnerable to mistakes due to human fatigue or inattentiveness, sloppy handling due to bad moods, etc. Smart, automated machine control, on the other hand, can maintain consistent quality for the entire production line, while also reducing labor costs required for production. Even if 24-hour manufacturing is required, the machine never gets tired, or angry, or goes on strike. Thus the factories' biggest headache of often not being able to find enough workers is resolved.

Evolved, Simplified, and Streamlined Smart Controller

Advantech LNC Technology Co., Ltd. provides dedicated functional controllers (often called the brains of smart machines) for various processing and tooling machines. One Advantech LNC controller has assisted a mobile phone foundry in Shenzhen, which employs tens of thousands of workers, to construct a smart, automated assembly line.

Kuo indicated that not only does the foundry have to satisfy the ultra-high quality requirements from leading mobile phone brands worldwide; it must also face increasingly tight delivery deadlines or sudden product shipment surges. Production through manual labor alone would often have led to inconsistent quality, as well as difficulties in increasing the production speed or for the foundry to find workers to expand its production capacity when the number of products to be shipped suddenly doubled. Therefore, the foundry constructed a six-station robot production line for its mobile phone casing assembly. Although the robots look similar, they each perform a different function. Furthermore, said Kuo, "Advantech LNC has enabled the six robots to use the same brain through a single dedicated controller. Not only has the production quality and efficiency improved, but when the production line requires some precision fine-tuning

or they use the robots to assemble newer models in the future, only the controller's software needs to be changed, which means the task is easily accomplished. There is no need to have brand new equipment in order to satisfy different processing or assembly requirements as was needed in the past."

The benefits of smart applications do not stop here, however. Kuo mentioned that traditionally, one worker must be assigned to every machine on the production line to facilitate material reloading. Therefore, larger manufacturers that have tens of thousands of processing machines often use mechanical arms to perform repetitive movements such as reloading materials. However, because the equipment suppliers cannot provide the core technology, the compatibility between the machine and the mechanical arms is less than what was expected. At this juncture, Advantech LNC's "embedded robots" plays a key role. "The two-in-one control method can simultaneously control the machine and the mechanical arms. Not only does this system reduces the space needed for equipment installation in the factory, it also improves safety for the areas surrounding the machine. After integration, smoother control allows for greater financial benefits."

Industrial Robots Provide Solutions for the Manufacturing Industry

Manufacturing sectors worldwide are facing a variety of challenges. For example, high labor costs in the United States are thwarting its efforts to rally manufacturers to return to the country. Even though European companies can establish factories in the nearby Eastern Europe or Turkey, these companies are also facing the dilemma of a shortage of skilled workers. In the past, China attracted major foreign manufacturers to locate their factories there due to its abundant human resources and easy land acquisition, which helped China to gain the nickname of "the world's factory". However, manufacturers are now facing difficult challenges. Labor costs and labor disputes have gradually increased each year, and manufacturers need to address ever more stringent quality and productivity requirements as well rapidly responding to changes in the market.

Kuo believes that the smart application of industrial robots is the solution to these problems. At present, numerous manufacturers are eager to make use of industrial robots. However, because the needs by the automotive, food, electronics, and semiconductor industries vary widely, only partners that have a deep understanding of control technology can resolve the various problems. Advantech LNC has many years of solid R&D experience. It is an upstream supplier of the controllers used by equipment manufacturers, and collaborates with those equipment manufacturers through customization projects to provide more value-added applications. Therefore, Kuo believes these cost-effective and practical products can create more advantageous core competitiveness for the industry. □

Making the Best of Computer Technology to Revitalize Industry

With fast changing product designs, complex manufacturing technology, and shrinking profit margins due to market competition, fully automated control systems through hardware and software integration is the only way to effectively increase the competitiveness of the machinery industry, and the only way to upgrade traditional manufacturing industry to high-end manufacturing.

Writer | Xiao-Jing Yu

Interviewee | Vincent Li, Business Development Director, Machine Automation Sector, Advantech China

Mr. Li , the owner of a traditional manufacturing plant, visited the International Machinery Automation Exhibition and made the Fully Automated Numerical Control Machine booth his first stop. Watching 3D animations on a computer and listening to the talks and presentations, he learnt that with the help of automation systems, tube fittings can go through various tube bending simulations before manufacturing, and parameters can be directly edited and amended in the computer in order to rotate the direction of the tube. Also, after completing computer simulations, calibration and testing, the numerical control tube-bending machine would be able to automatically mass produce various types of bent tubes according to requirements, based on set values.

Mr. Li was so excited with this possibility because it saved time and effort, and ensured high product quality. When he returned to his company, he asked his purchasing department to assess the solution and install it on the production line as soon as possible so as to increase their competitive advantage in the market.

Meet the Challenges of the New Generation through Innovation and Creativity

In the early days, machinery in industries such as in the commodity sector, chemical industry, and the metal industry, did not need to be replaced frequently as there were fewer changes in downstream applications and in production equipment. However, due to the increasingly fervent demand for innovation and change in the market, upstream manufacturers and suppliers of machinery and equipment had to deal with the pressure of shorter product manufacturing times, faster changing product designs, and shrinking profit margins due to market competition.

Vincent Li, Business Development Director of Machine Automation Sector, Advantech China, said that manufacturers or equipment suppliers need to respond to today's rapidly changing demands through innovation and creative thinking. For example, steelworks that provide steel for industries such as construction, automobiles, and ship building used to cut steel to size and shape using a linear cutting torch method. But today, with greater demand for irregular shaped steel, they need to use a higher precision automated motion control process to achieve smoother cutting. Another example is in the textile industry, where fabric is now cut and made into clothing in high volume. They can no longer rely solely on manual cutting to process the huge batches of fabric, instead of making make use of computers to drive fabric cutting machines in order to make precise fabric cuts according to design. In addition, they are able to cut large surfaces or concurrently cut dozens of pieces of fabric. So these machines are an essential tool to increase work efficiency and production quality.

"Past manufacturing methods focused on speed and quantity, but they can no longer meet market demand, so production methods that increase product quality and reduce manpower, time and overall operating costs has become the only way for companies to attain excellence and increase enterprise competitiveness," said Vincent.

Achieve High-precision Manufacturing Through PC-based Technology

But what are the differences between traditional applications and new generation high-end applications? Mr. Li took tube-bending manufacturing as an example, and said that in the early days, tube-bending machines made use of PLCs to control the machinery, and could only provide basic processing functions. Therefore, they still relied on the operators' judgment to record the correct procedures after repeated tests before passing them to the production line for manufacturing. Also, during the manufacturing process, the operators need to pay attention to all times and make appropriate adjustments in order to prevent deviations of the metal pipes' bending angle. However, with the next generation PC-based technology, which provides excellent graphics processing, capabilities such as precise control, complex calculation, and mass storage can be attained. This allows production lines to be involved in repetitive mass production to attain both product quality and capacity.

Mr. Li said that, "For controlling repetitive actions, the precision of PC-based motion control is much higher than that of PLC motion control. Take an application that implemented Advantech's tube-bending machine solution for example. It is able to manufacture high-quality bent tubes with up to +-0.2 degree repetitive precision, which is excellent. Also, the metal bent tubes manufactured have tolerable error ranges, eliminating non-uniform shape and quality problems." In addition, Advantech's CNC fully automated tube-bending machine control system provides 3D preview functions, which eliminate the need of using actual tubes for testing. They only need to enter the processing parameters and then determine the most appropriate and smoothest tube bending operation through computer simulations. As a result, the need to temporarily stop for tube testing was eliminated, which also reduced the scrap generated from faulty tube bending prior to production.

Providing database functions is another advantage for PC-based equipment. Vincent said that, "Customers have different demands, so there could be up to tens of thousands types of tubes manufactured by tube bending plants. PLCs suffer from small storage and have no database, which is inconvenient for plant management and operation. However, PC-based solutions offer a massive storage capacities. users only need to enter the code to find each customers' previous tube bending projects, and this in turn increases the speed of new production. This means products can be made as soon as possible."

Traditional Manufacturers Achieve Quicker Upgrades by Introducing New Technology

As long as the computer is able to transform a blueprint into track movements, and pass the actions to the various tools at the front end, such as clamping heads, flame guns, and fabric cutting machines, PC-based applications can be used to replace the old PLC controllers, which cannot provide drawing functions. And, if there is a need to repeatedly produce tens of thousands of units of a product, product quality can still be maintained. These systems provide great assistance for traditional companies as they transform into high-precision manufacturers. At present, Advantech supplies systems that provide underlying control, assisting steel cutting equipment suppliers and automobile glass cutting equipment suppliers to upgrade their machines, and export them to the world.

In addition, small and medium plants might want to upgrade their facility but do not know how to start. So, Advantech launched a Solution Ready Package, which provides exclusive motion control systems and software integration solutions for industrial machines according to customer requirements. And the results are excellent so far. For example, in Zhejiang's Huzhou, where the textiles are listed as a major industry, there are many fabric cutting machine suppliers that use Advantech's system. In addition, in the biggest tube bending region in China, Zhangjiagang of Suzhou, almost 20% of manufacturers use Advantech's fully automated tube-bending machines, which boasts 3D preview features.

Vincent believes that Advantech is not only a leading PC-based company in terms of hardware, but also a company which can carry out collaborative software development with equipment suppliers. It also has local service centers and professional service teams all over the world. They hope to be an ideal partner for both manufacturers and equipment suppliers, and thereby effectively assist them in swiftly upgrading from traditional manufacturing to high-end intelligent manufacturing by meeting the challenges of tomorrow with robust manufacturing capabilities. □

Moving Towards High-end Automated Manufacturing

As manufacturers move towards nano-sized electronic components, new technologies must be introduced in order to achieve a highly stable and precise manufacturing process. Integrated motion control and optical machine applications can improve the management efficiency of plant operations and customer satisfaction while maintaining proper capacities and yields.

Writer | Xiao-Jing Yu
Interviewee | Ethan Huang, Senior Director, iAutomation Group, Advantech

After entering a personal password, Ethan enters the factory manufacturing system and starts to review the LED production conditions for the past few months on the computer. He discovers that ever since the motion control and machine optical sorting equipment was installed, high-speed image detection and pick-up operations have enhanced overall production capacity by 20%, while also decreasing the probability of defective product outflow from the facility.

Replacing the visual defect sampling method with an automated optical defect detection system has significantly reduced the customer's product return ratio. For Ethan, who has to manage numerous workers and machines as well as maintain productivity and yield, an MES system that can be automatically incorporated is the secret weapon that enhances both the plant operation management efficiency and customer satisfaction.

The Finer the Product, the more Sophisticated the Detection Control Management

As electronic products becomes lighter, thinner, smaller, and pack in more diverse functions in order to satisfy market demands, electronic packaging related process technology becomes increasingly more sophisticated and complex.

Ethan Huang, Senior Director, Advantech Industrial Automation Group, indicated that the trend towards nanotechnology is inevitable for electronic components, but this trend also poses unprecedented challenges to the manufacturing, packaging, and testing industries. Imagine having to place hundreds of solder balls or pins on a 2-centimeter wide IC chip. If visual detection is used for such fine products, it would be inefficient and error-prone. Think about a printed circuit board (PCB) with 10 or more layers as an example. Prior to the press-fitting, if the product is not checked layer by layer for problems and is directly manufactured, the product would never pass quality control and would have to be scrapped, which would be a huge waste of raw materials.

Therefore, high precision optical identification machines with multi-axis movements have become a critical tool for the electronic product manufacturing process. But Ethan stressed that new electronic packaging units need more than fine machine optical detection operations to perform tasks that cannot be accomplished by the human eye. Motion control technology must also be more miniaturized. The thousands of steps that have to be completed within one cycle of an electronic motor in the past have evolved into millions of steps. If machine optical detection and control movement functions have to be executed simultaneously, the quality of the product can be defined by whether all of these steps can collaborate with each other.

Ethan stated that, "When a moving IC reaches a detection position, the system must send a signal to tell the camera to take photographs during high-speed movement. If the signal is not synchronized, photos may be taken too early or too late. The vibrations of the machine may also blur the photos taken. The operations that require rapid movements and stops also pose a big challenge for the stable operation of the machine."

Because Advantech is well aware of the importance of perfect collaboration/synchronization between the machine optical detection and the movement control, it has worked hard in areas such as algorithms,

controllers, light sources, and lenses. With Advantech's ability to provide Industrial Personal Computers (IPCs), motion control cards, smart cameras, open software platforms, and other related products, Advantech helps to save money and time searching for ways for devices to communicate with each other, and helps them to resolve the incompatibility problems that arise from devices that come from different vendors. Ethan indicated that Advantech can provide comprehensive integration programs to enable electronic manufacturers to truly achieve efficiency and quality enhancement objectives, while also pursuing quality excellence for products manufactured through automated production lines.

Optimized Integration Solutions can Effectively Enhance Productivity and Yield

High-performance multi-axis motion controls and the full range of machine optical detection solutions provided by Advantech for the electronic packaging industry have a very wide range of applications. They include precision laser cutting, solar cell testing, PCB testing, smartphone panel printing, panel defect detection, wafer wiring/testing/cutting, or LED solid crystal production.

After a well known panel maker added Advantech's mechanical optical detection solution to their production lines, its production lines' efficiency improved by over 10%. The new operating mode that uses a smart camera equipped with embedded image processing software to distinguish two-dimensional barcodes has eliminated the errors associated with manual barcode reading, and has also reduced the production line shut-down risks. In addition, the data obtained from the machine optical detection can also be integrated with the factory's MES system, which can resolve any size mistakes due to manual entry errors or insufficient supplies because appropriate products cannot be founded.
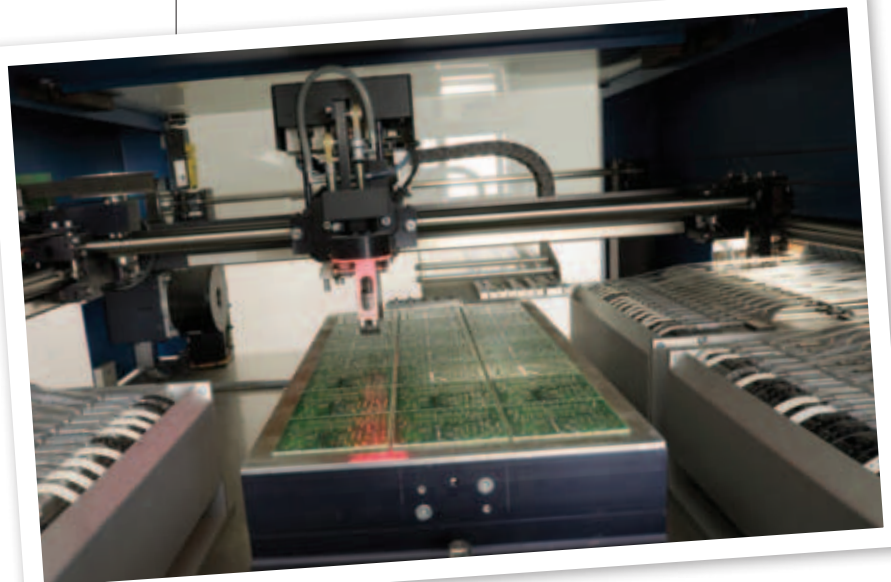
In terms of mobile phone manufacturing, Advantech's program can help to execute comprehensive glass cutting detection and provide motion control and machine optical detection needed to perform precision alignment during the most critical parts of the production process, or patching operations in order to prevent color ghosting problems from occurring in finished products. The LED manufacturing plants mentioned at the beginning of this article have also adopted Advantech's solution, to enable sorting equipment to execute image capture operations under high motion velocities, which can increase detection speed by 20% an hour and eliminate manual detection errors that plagued the factory in the past.

In addition, other industries can

also use Advantech's motion control and machine optical detection solution to improve quality control. For example, when injection molding factories use incorrect product removal procedures, the resultant left-over foreign residues and adhesives can damage the molds or create poorer quality finished products. Machine optical detection can be used to screen out these problems early. For a glass bottle manufacturing plant, optical machine detection can be used to detect bottle cracks through image capture at the speed of over 200 bottles per minute, to ensure that the plants' delivery speed and quality can satisfy the demands of the world's leading soft drink suppliers.

Ethan noted that, "At present, many Advantech's successful cases not only have met or exceeded expected results and gained high ratings from customers, they also indirectly showcase Advantech's technology and strength in the advanced automated manufacturing field."

Since the industrial revolution, production lines of manufacturing plants have continued to adopt processing innovations in order to achieve mass production, cost reduction, quality enhancement, innovation, differentiation, etc. Although the focus for each stage is a bit different, the universal objective of production efficiency optimization remains the same. Ethan believes that it is necessary to introduce new technologies in order to achieve a highly precise and stable manufacturing process, and the integrated motion controls and machine optical detections are the critical components needed to upgrade the automated applications into smart applications. Advantech hopes to use its professional skills and practical experiences accumulated over the years to quickly incorporate more precise applications for manufacturing production lines, and to boost more high-end automated production for the manufacturing industry. □