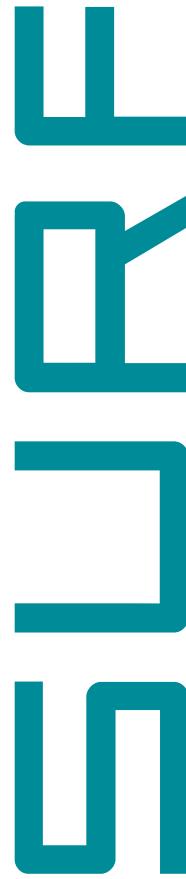


SURF

Solutions for Urbanised Future

VOLUME 10
JULY/AUGUST
2015

ARE YOU READY FOR
DIGITAL
TRANSFORMATION?



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TechConnect 2015: Digital Transformation in S'pore Grows in Maturity

Emerging technologies continue to have a disruptive effect on businesses.

Merging technologies like Cloud, Mobility, Cybersecurity, Big Data and Analytics (BDA) and Situational Awareness are top of mind for Singapore CIOs, according to the findings from the most recent NCS Solutions for Urbanised Future (SURF) Emerging Technologies Maturity Index 2015.

A majority (77%) of senior IT executives placed high importance on digital transformation and classified it as a vital contributor of their organisations' strategy to drive business growth. This is an increase of 2% from last year's SURF Emerging Technologies Maturity Index 2014.

Digital transformation is defined as changing processes to run more efficiently, which may be on traditional or modern infrastructure. This is to enable three things: better customer service, better operational efficiency, and sustained competitive differentiation.

Some 212 companies and government agencies from Singapore were surveyed, to understand their maturity levels in the adoption of emerging technologies. The respondents include CIOs, AVPs (Assistant Vice Presidents), GMs (General Managers), heads of IT departments, senior IT directors and senior IT managers overseeing local and



regional IT initiatives from organisations with revenues in excess of S\$70 million. This study was commissioned by NCS and conducted by IDC Asia Pacific.

Some 58% of CIOs indicated that senior management promote and support technology-led business transformation initiatives as compared to last year (+5%). In addition, the number of companies

that did not consider technology to be important for them has halved in 2015 as compared to 2014.

"This year's findings highlight a more mature digital transformation environment in Singapore. The emphasis is on building sustainable business models by leveraging technology to drive top-line growth," said Chia Wee Boon, CEO of NCS.



TECHCONNECT 2015: DIGITAL TRANSFORMATION IN S'PORE GROWS IN MATURITY

For many organisations, digital transformation is not the end-goal. They realise that it is necessary to integrate existing resources with online resources to seamlessly enhance operations, enable better customer centricity, and compete better in the market, said Mayur Sahni, Senior Research Manager, Services and Cloud Research, IDC Asia Pacific.

"Once you change the way you engage with customers, that's when your leadership skills come into play in a major way," said Sahni. He noted that the role played by the leadership among Singapore companies is high.

Singapore companies view digital transformation as important, with the priority being in the following order: customer retention/acquisition (22%), need to drive innovation (19%), and to manage the cost of operations (15%).

These business drivers have changed from 2014, where the emphasis was customer demand, competition, followed by the need to drive innovation. The key objectives

have also changed. Now, the transformation initiatives have clear financial objectives.

In 2014, the objectives were profitability, operational efficiency and customer centricity. In 2015, the top three objectives are: profitability, revenues and lowering risk of doing business.

The focus on lowering the risk of doing business is due to the desire to reduce risk in various areas: financial, operational, regulatory compliance, and IT risk. The requirement for compliance is industry-specific and it can be high for some industries.

DISRUPTIVE FORCES

Digital transformation has had a disruptive effect on the traditional way in which business is done, said Sahni. For instance, Singapore companies have gradually experienced a big shift in the transactions space, where mobile apps and machines have transformed how payments are typically made. For instance, taxes can be paid by cheque, through Internet banking facilities, and even

from self-service kiosks like vPost, SAM and AXS machines found all over Singapore.

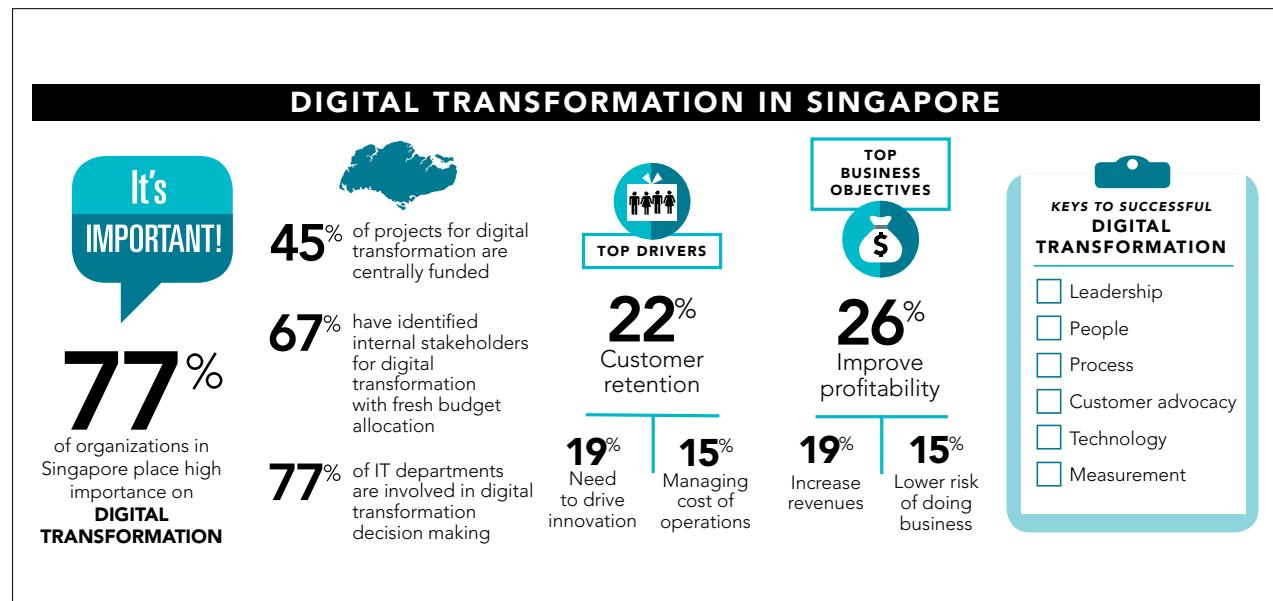
China's Alipay, a third-party online payment platform by the Alibaba Group, now has the largest market share of China's online payment market, an area that is traditionally dominated by financial companies.

In the transportation space, taxi booking apps like GrabTaxi and Uber have been a disruptive force in taxi booking services, having grabbed market share from the incumbent taxi operators who used to own the lion's share of taxi bookings.

Even online shops have taken market share away from the traditional brick and mortar shops, offering competitive prices, enabling purchases made just by tapping on a mobile device, saving the shopper the inconvenience of going from store to store to compare prices.

FOCUS ON IOT AND BDA

Singapore businesses use Situational Awareness or Internet of Things (IoT) and Big Data & Analytics (BDA) technologies for a variety of





CORE TECHNOLOGIES FOR DIGITAL TRANSFORMATION

CLOUD

16% have cloud as their LEAD INITIATIVE



BDA

9% have BDA as their LEAD INITIATIVE



MOBILITY

27% have mobility as their LEAD INITIATIVE



ROLE IN BUSINESS TRANSFORMATION

% leveraging cloud, BDA or mobility to create business transformation opportunities



Close to 50% look to cloud for access to NEW CAPABILITIES for COMPETITIVE EDGE



42% are investing in BDA to drive specific business objectives for individual lines of business focused on BETTER OPERATIONS and CUSTOMER EXPERIENCE



36% leverage mobility for employee enablement in the field for BETTER CUSTOMER DELIVERY



KEY INVESTMENT AREAS

HYBRID CLOUD IS PREFERRED



95% have invested in PRIVATE CLOUD with 41% opting for hosted private cloud



FASTER AND BETTER RESPONSE TO CHANGE

50% have invested in REAL TIME ANALYTICS, 39% in visual/video analytics and 37% in meta data management solutions



LEVERAGING MOBILE TECHNOLOGY TO BETTER SERVE CUSTOMERS

27% have extended CORPORATE APPLICATIONS to mobile devices for internal users and another 27% have invested in mobile device management solutions



- Business analysts
- DevOps
- Service management specialists
- Infrastructure specialists

- Data scientists
- Analytics resources for specialist functions
- Data management specialists

- Customer experience management
- MDM specialists
- DevOps
- Project managers



purposes such as increasing operational efficiency, improving compliance and business continuity across the industrial spectrum.

Some 45% of Singapore CIOs have already invested or are currently investing (+11.5% compared to 2014) in Situational Awareness technology. The survey shows that 41% more businesses are in a position to pursue specific business

use cases by using Situational Awareness technologies.

For 21% of businesses, Situational Awareness technologies are the lead initiative for digital transformation. The key drivers are: compliance, operational efficiency, and visibility into operations.

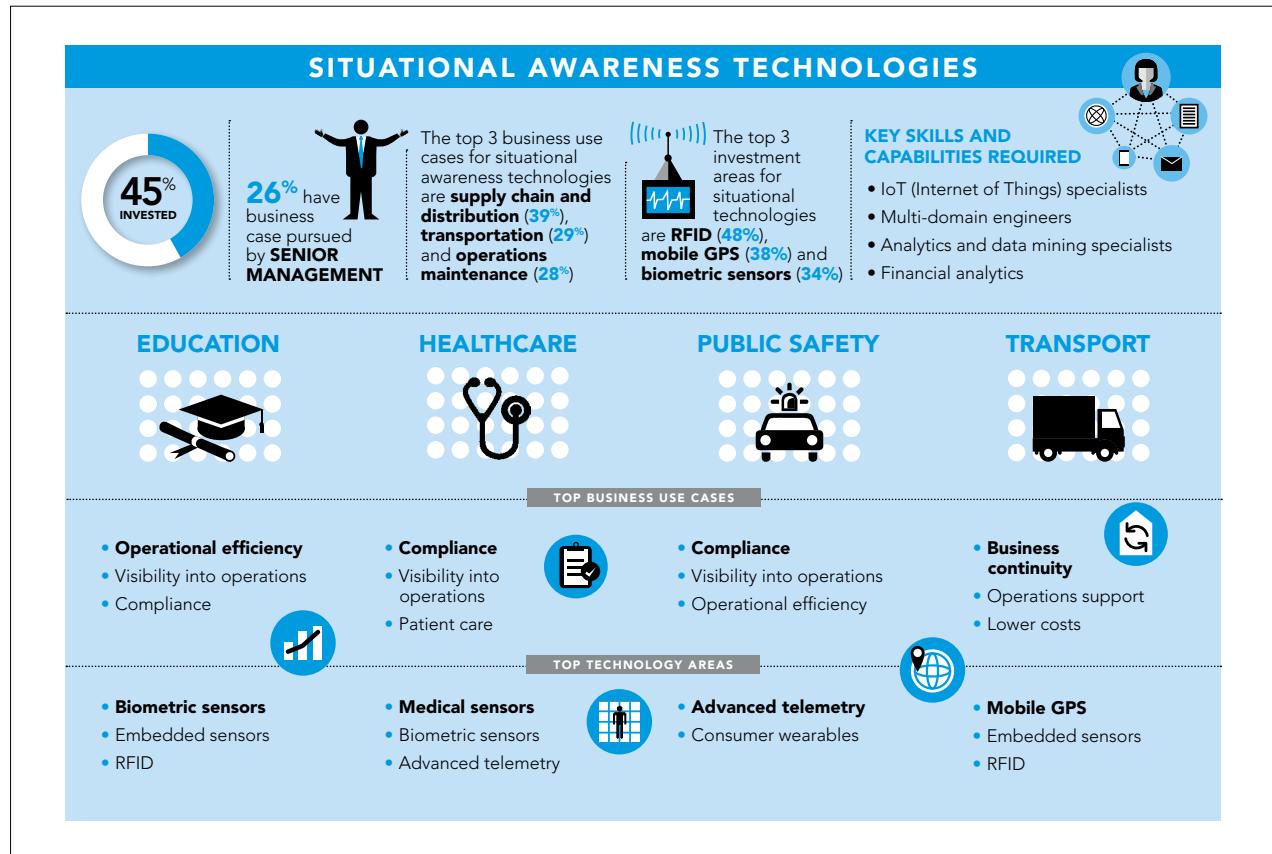
The top three business use cases for Situational Awareness are supply

chain and distribution (39%), transportation (29%), and operations maintenance (28%), while the top three investment areas for situational technologies are radio-frequency identification or RFID (48%), mobile Global Positioning System or GPS (38%), and biometric sensors (34%).

In BDA, almost half of the respondents (49%) are looking at scaling up



TECHCONNECT 2015: DIGITAL TRANSFORMATION IN S'PORE GROWS IN MATURITY



adoption. This shows that while the potential for BDA is high, businesses are still scaling up use cases.

Singapore CIOs (25%) are currently investing (+6.5% compared to 2014) and 49% of them have future investment plans (+6.6% compared to 2014). Current Big Data initiatives in enterprises are largely related to specific use cases and lines of business, and are not usually enterprise-wide.

Some 38% of respondents have already invested in BDA, and 42% are investing in BDA to drive specific business objectives for individual lines of business focused on better operations and customer experience.

In the BDA area, the key investment area is on faster and better response to change, where 50% have invested in real-time analytics,

39% in visual/video analytics, and 37% in meta data management solutions.

PRIVATE CLOUD PREFERRED

Half (51.4%) of respondents say they are investing in cloud, and for 16.2%, cloud is the lead initiative for digital transformation.

Some 46% of respondents see cloud as a technology area which gives IT new capabilities to address business challenges and 13% view cloud as a competitive differentiator for their business.

In this year's survey, 50% more businesses as compared to 2014 are scaling up on cloud to move standardised workloads. The emphasis is on improving competitive ability and driving innovation by using cloud, as 16% of the businesses believe that cloud is the lead initiative

for driving digital transformation.

In particular, the hybrid cloud is preferred by Singapore organisations, with 95% having invested in private cloud and 41% opting for hosted private cloud.

MOBILITY STILL KEY

Mobility technologies are of increased importance to business, where 59% of businesses have and are investing in mobility.

This shows that the adoption of mobility solutions in Singapore remains quite stable, where 27.4% of respondents, just like last year, continue to leverage mobility as the lead initiative for digital transformation.

The focus has shifted from internal applications and processes that involve mobilising the workforce, to mobilising the ecosystem with a



strong level of emphasis on customers. Some 36% of respondents say they leverage mobility for employee enablement in the field for better customer service delivery. This focus on customer service is shown by the fact that 27% of respondents have extended corporate applications to mobile devices for internal users and another 27% have invested in mobile device management solutions.

However, the number of businesses that were confident of managing risk with the adoption of mobility has halved. This is largely because earlier mobility initiatives did not have the right investments in security tools and governance frameworks.

Another consideration is finding the right person for the job, as the technology piece of digital transformation is "the easiest problem to solve", said Sahni.

The challenge facing businesses is the tech talent crunch, where there is a shortage of the important skills and capabilities required to implement digital transformation technologies. These include business analysts, DevOps, service management

specialists, infrastructure specialists, data scientists, analytics resources for specialist functions, data management specialists, and customer experience management specialists, Mobile Device Management (MDM) specialists, and project managers.

So while Singapore businesses continue to move towards a more mature digital transformation environment, they will also need to grapple with finding the right talent to drive this transformation.

NEW CYBERSECURITY MINDSET

The survey demonstrated a high level of security awareness, but more high-level oversight is needed.

Security has been included as one of the focus areas of research, where a majority of respondents (70%) say that information security activities are managed by Chief Information Security Officers (CISO), and only 35% of them have dedicated cybersecurity specialists.

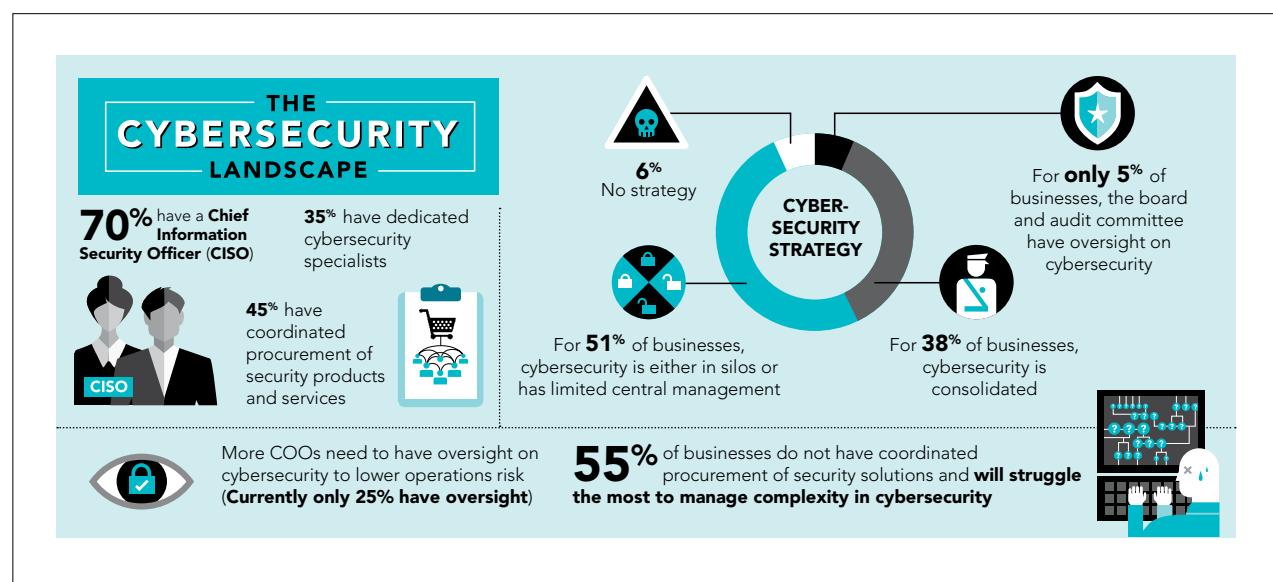
In addition, Singapore CIOs (55%) also indicated that their organisations do not have coordinated procurement of security solutions and will struggle the most to manage complexity in

cybersecurity. Also, 62% do not have any overseeing committee on security for business operations.

In terms of cybersecurity preparedness, respondents claim to have a very strong cybersecurity response capability, with 65% of businesses claiming that their critical applications have been staged for rapid recovery after service interruption and that their security operations are prepared for "zero loss" of data or uptime. However, only 31% think that their cybersecurity plan is prepared for the entire network.

While the research findings reveal that Singapore CIOs are deepening emphasis and investment on IT security technologies, they still need to identify security solutions that enable them to rapidly detect, analyse, and respond to targeted attacks and advanced threats for enhanced protection.

In the final analysis, Singapore businesses do place a high premium on digital transformation to drive innovation and business growth, and will continue to leverage BDA, Cloud, Cybersecurity, Mobility and Situational Awareness technologies to fulfill their goals.





Make a Difference with Data Analytics

Mix analytics with domain expertise for better business outcomes.

Domain expertise is critical when it comes to analytics, as it can mean the difference between business-relevant and irrelevant insights. Success in analytics requires more than quality data and capable data scientists, as the addition of domain knowledge can help to address business problems more accurately, said Dr Clifton Phua, Associate Director at NCS.

The use of Big Data and analytics has become more prevalent in the corporate world, and it is no longer a secret that it can unlock success to give companies a competitive edge, or to bring them a step ahead of the competition. However, a major challenge today is to build a strong data analytics team.



"A key challenge is to find the right talent – data scientists with the expertise and experience," said Phua. "And then for the team to work as a coherent whole."

The NCS analytics team is unique because of the synergy between the strong team of data scientists and domain experts.

This industry-specific experience residing within NCS is a key strength, as it means the analytics team has both technical and domain knowledge. They can tap on the expertise of domain experts in industries such as government, healthcare, education, defence, and financial services, to provide an end-to-end analytics solution from consultancy to implementation services.

Another trend is the emergence of cloud analytics, such as IBM BlueMix and Microsoft Power BI with Windows Azure, Tibco Spotfire Cloud, and Tableau Software. These have allowed organisations to derive insights from data that may be from external sources, based on less sensitive corporate data. Instead of having to build large and complex data warehouses, these cloud analytics platforms enable a more agile approach to data analysis, and insights may be gleaned through simple drag and drop actions.

In a presentation "Analytics for urban solutions: from data fusion to actionable awareness" during TechConnect 2015, Phua spoke about how analytics can be used to help organisations in different industries better engage with customers and to deliver services more efficiently and effectively.

PREDICTIVE POLICING

In a demo showcase, NCS showed how predictive and analytical techniques can be used in law enforcement to identify and deter potential criminal activity. These techniques have helped to identify the people and locations with an increased risk of crime, in order to build strong relationships between police departments and their communities to solve crime problems.

To predict crime risk, Predictive Analytics was applied to gain insight into where crimes are likely to happen in the future, and to optimise resource deployment and produce more optimal patrol plans. These decisions are based on the predicted crime risk and take into account factors such as weather, population demographics, and the location of police posts.

A clustering algorithm is used in data mining to detect crime patterns, anticipate possible crime trends, and



to provide an insight into the different locations that a police post can be responsible for. Optimisation techniques are used to determine more efficient police patrol plans, based on the shift, type of police vehicle and the number of stops to minimise and deter crime.

TRANSPORT ANALYTICS

NCS also demonstrated how analytics can be used to identify train congestion bottlenecks and to predict when trains may break down. Business Intelligence is used to identify the travel pattern of commuters and Congestion Current State Analysis is used to understand and visualise current business performance and identify congestion bottlenecks.

Optimisation technology is used to simulate passenger load on trains, and simulation experiments are run where model parameters are adjusted to determine an optimal plan to alleviate congestion with cost-effective measures. Possible measures to ease congestion is to increase the number of train cars or implement a free ride policy.

Predictive Analytics can also be used for train maintenance by analysing sensor data and other data sets to

statistically pin-point assets that are predicted to malfunction. This helps the train operator to implement targeted maintenance programmes and optimise maintenance cost. The larger goal is to predict train breakdowns, by studying the factors and root causes of these breakdowns.

EDUCATION ANALYTICS

In the area of Education, analytics can be used to improve student grades, retention, and offer better services to students. To enable this, education institutions need deeper insights into the factors that affect student results and completion rates.

Predictive Analytics and clustering technology can be adopted to analyse the Institute of Higher Learning (IHL) application form data, which is combined with data from past year students, in order to predict the course that will lead to the best results for the student. This helps to find a better fit between the students' talents and the course of study.

This data is also useful to predict when the student matriculates, whether he/she may be at risk of dropping out, and so identify the specific student who is at risk of poor grades. This alerts teachers

and lets them intervene with appropriate measures.

HELPING HOSPITALS

Healthcare and hospitals are under pressure to reduce readmission rates, and analytics can play a role to achieve this.

Predictive Analytics when applied, can help to determine the trend for readmission over time, the bill size and readmission rate for different key diagnosis/diseases within a six-month period, and which patients are likely to encounter post-discharge difficulties. This knowledge allows hospital staff to take steps to follow up with patients who are likely to be readmitted, to help reduce the readmission rate.

Another focus has been on forecasting bed occupancy rates, in order to understand which diagnosis or specialty areas require more bed and staffing resources. This helps hospitals to anticipate bed demand in order to manage resources more efficiently.

NCS has also used text analytics on patient case notes to highlight to hospital administrators what may not be obvious. This is achieved by extracting key words and their associations.

In parallel, clustering technology on patient data allows hospitals to better understand their demographics, to gain insights into similar patients and any trends that may emerge.

Ultimately, with growing competitive pressures, organisations are turning to analytics to drive their performance and gain better business outcomes.

Different Approaches

The type of analytics carried out by NCS spans a wide variety. They include:

- Foundation analytics (e.g. statistics, database, machine learning)
- Data mining (e.g. anomaly detection, predictive analytics, clustering, and association and sequence analysis)
- Forecasting (including Time Series Methods)
- Network analysis (in particular, Social Network Analysis)
- Text analytics (including Social Media Analytics)
- Optimisation (especially Operations Research, such as Discrete Event Simulation)
- Complex Event Processing (CEP) - real-time analytics
- Hadoop analytics (e.g. Mahout, Spark, Storm)

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Take the Pain Out of Detecting Illegal Parking

A Proof-of-Concept for detecting illegal road-side parking using camera mounted on moving vehicle by I²R and NCS shows how to cut costs and congestion.

The sight of traffic wardens pounding the streets in the hot sun or thunderstorms to issue parking tickets may soon be a thing of the past.

A MOBILE SOLUTION

To resolve several issues faced by enforcement officers, a Proof-of-Concept (PoC) for detecting illegal road-side parking using cameras mounted on moving vehicle was developed. This solution, System for Open Parking and Integrated Enforcement or SOPHIE, uses a video camera installed in an enforcement vehicle.

The SOPHIE system was developed by a research team from A*STAR's Institute for Infocomm Research (I²R), in collaboration with NCS. The I²R team focused on the algorithm design and system development, while NCS worked on video collection for algorithm training and testing. The project lasted for a year, from April 2014 to March 2015.

The intention of this new system is to alleviate the job of the enforcement officers, as only one officer is required to drive an enforcement vehicle to record videos of vehicles that are parked along the street. This video is collected by a camera mounted onto the enforcement vehicle's windscreens. As the vehicle cruises down the street, it collects information about the parked

vehicles, parking lots, and licence plate numbers.

Back at the office, the videos are downloaded and the SOPHIE system will analyse the recorded videos, comparing the downloaded data against a set of pre-defined illegal parking rules. Then, illegal/improper parking can be identified based on the parking scheme, the relative position of the parked vehicle and the parking lot.

An illegal parking record will be automatically created, capturing details like the corresponding parking time, parking place, plate number of the illegally parked vehicle, video frames of proof, and the violated parking rule. This is then routed to the officer for verification.

As the data is in a digital format, it

is easily stored in a centralised location, allowing for easy storage and retrieval when needed.

INTEGRATED TECHNOLOGY

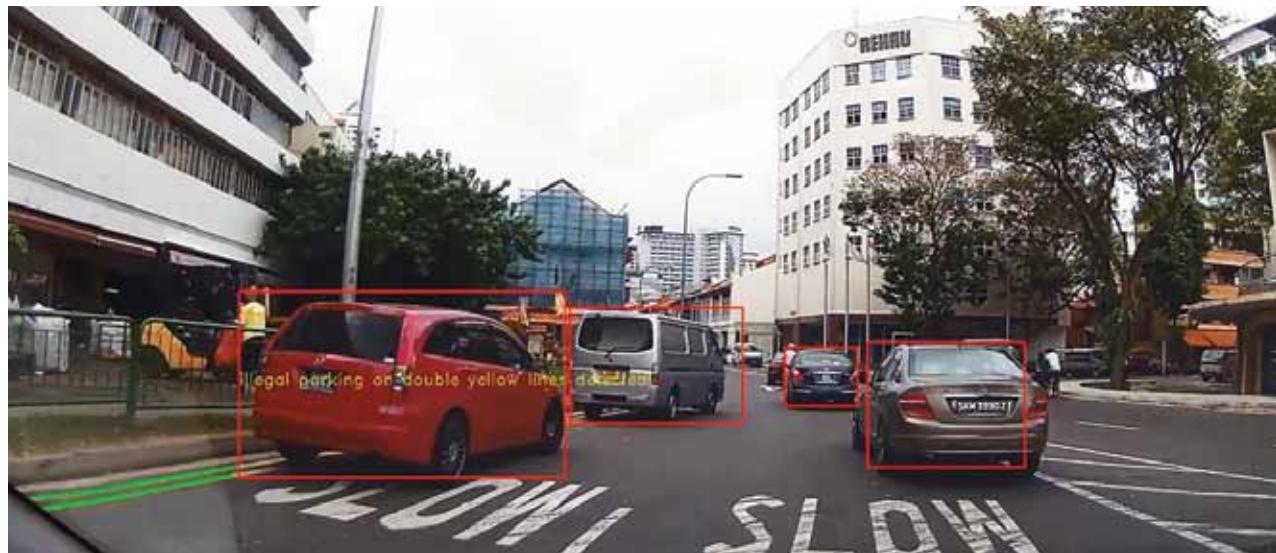
The SOPHIE system comprises a suite of integrated technologies with a single user interface. This eases the adoption and implementation process.

The SOPHIE system integrates four technical modules for mobile illegal parking enforcement:

1. Automatic number plate recognition that reads the plate number from a mobile camera
2. Detection of different road markings such as double yellow lines, single centre white lines, etc.
3. Parking lot detection that determines location of a parking lot
4. Vehicle detection which automatically detects vehicles,



Spotting vehicles parked on centre white line



Detecting an illegally parked car on a double yellow line

recognises the vehicles' orientation, and identifies whether the vehicles are moving or stationary

For instance, in the case of an illegally parked car on a double yellow line, SOPHIE will detect the following:

- A stationary vehicle,
- Existence of double yellow line in the neighbouring region,
- Non-existence of a parking lot that encloses the vehicle, and
- The vehicle plate number.

CHALLENGES FACED

However, building the SOPHIE system had its share of challenges. The first is related to the camera that is mounted on a moving vehicle. The four technical modules are often developed for a video footage captured by a stationary camera and it becomes much more challenging when the camera is moving. For example, it is very difficult to read plate numbers from a perspective view for vehicles that are parallel parked. The second is related to the video data, where the automatic analysis and understanding of videos captured under an uncontrolled outdoor environment is very challenging. The third is related

to data collection. It is very difficult to collect video footage of vehicles that are parked illegally under different illegal parking scenarios such as parking along double yellow lines, parking across two neighbouring parking lots, parking beside the painted island etc.

The SOPHIE system stands out for its use of a moving camera, which makes it possible to capture video in a moving vehicle. Other illegal parking enforcement systems typically use stationary cameras to detect illegal parking which have very limited coverage. To increase the coverage with stationary cameras, a significant amount of new

infrastructure needs to be set up, including cameras, power, communication facilities, etc.

Going forward, I2R and NCS will continue to add more features to SOPHIE. In the pipeline are plans to improve the video processing speed for tasks that require real-time decision and response. A second area is to collect more video data under various weather conditions such as heavy rain, heavy dust, night, etc. to increase the robustness of the system. Finally, the ultimate goal is to integrate the SOPHIE system with autonomous vehicles to realise zero-officer mobile illegal parking enforcement in three to five years.

Efficient Parking Law Enforcement with SOPHIE

The SOPHIE system can play an important role in the Smart City framework, helping to ensure an effective transportation system. It can also ease the pressure on existing urban mobility systems that are often inadequate, and are facing greater demands with increasing populations. It is critical to cities like Singapore that face challenges such as limited physical resources to maximise the use of existing driving and parking space, and limited human resources to carry out the detection of illegal parking.

For enquiries, please contact Ching Yin Sing, Business Development Director, Communications Engineering at yinsing@ncs.com.sg



NCS TechConnect 2015: A Taste of the Future

How to drive smart city innovations with digital transformation.

Watching a drone deliver the NCS Technology Evolution book over a sea of people gave a taste of how drone technology can rewrite the future of delivery models, and how technology can transform lives.

Some 350 IT professionals sat in rapt attention as this delivery marked the launch of the NCS Technology Evolution Book at NCS' annual industry conference, TechConnect 2015.

Held on 22 May at Marina Bay Sands, attendees gained insights into the smart city technologies that can empower businesses through talks and conversations delivered by NCS industry partners and IT practitioners.

The event started with the launch of the book to commemorate Singapore's 50th birthday. The book traces the history of IT and its transformation in Singapore, through the eyes of the past NCS CEOs and NCB Chairmans (NCS was previously known as NCB or National Computer Board). Since its inception in 1981, NCS has grown from strength to strength, making inroads in harnessing new technologies for various industries and is poised to help the nation embark on the Smart Nation journey.

"Fiscal year 2015 was a record year for us," said Chia Wee Boon, CEO of NCS. He proceeded to unveil the key findings of the NCS Solutions for Urbanised Future (SURF) Emerging Technologies Maturity Index 2015, and how NCS can help organisations

accelerate Smart City innovations through digital transformation.

Chia noted in the opening address "Smart City Innovations Within Reach" that digital transformation is possible when data is digitised, due to the growing level of maturity of technology adoption in Singapore.

Looking at the statistics from the SURF Index, he said: "The numbers are all mind-boggling. We have only one conclusion: the numbers are big and the potential [for digital transformation] is huge."

He said that at TechConnect 2013, he had mentioned that the development of IPv6 would have a huge impact before smart nation and smart city become fashionable.

"Every single thing that exists on planet earth can be addressed as long as it is IPv6-enabled. If all this data is collected, pulled into some form of repository and technologies applied, it will have a huge impact," said Chia.

The next big thing would be the smart home, which in turn would enable the smart city. The smart home is where smart appliances make life run more smoothly, news and traffic updates are dispatched digitally to the home, and the well-being of the elderly can be monitored through video cameras.

NCS' response is to focus using emerging technologies in four key areas: Transport, Education, Healthcare and Public Safety. In the transportation sector,

technology can enable a more delightful travel experience, more efficient transportation management, and sustainability. The focus in the education sector will be on self-directed, collaborative learning through 1-to-1 computing environment and other emerging technologies, said Chia.

In the healthcare area, NCS is working to improve the quality and efficiency of health services with technologies like medical wearables, fall detection sensors, remote monitoring, tele-triage used to manage elder care at home. For public safety, NCS is using technology like analytics, predictive modeling, multiple live data feeds from CCTVs and other sensing or machine-to-machine technology to heighten situational awareness and improve public safety responses.

Other guest speakers from NCS industry partners and practitioners spoke on topics that included:

- Using **sensors and data** to derive situational awareness,
- **Predictive analytics** for consumer behaviour or early intervention of operations,
- Improving quality of **big data** transmission and dissemination,
- Responding to real-time alerts and situations using **complex event processing**, and
- Staying ahead in the **security curve** to counter persistent cyber attacks.

TechConnect attendees also had a first-hand experience of more than 15 live demos of solutions at the showcase area.



From L to R: Neo Yong Chiang, Amit Dhupkar, Chia Kok Hong, T.C. Seow, Martin Lim, Manish Joshi, Mayur Sahni, Lim Leh Hoon, Biren Kundalia, Mayda Lim, Danny Ong, Nehal Patel, Thomas Teo, Rajamani Gopalakrishnan, Annie Lim, Liu Shenyen

Disruptive New Business Models

Roundtable participants say that digital transformation can be tricky.

Even as businesses undergo digital transformation – where technology is used to dramatically improve the performance or reach of organisations – the challenge for organisations is deciding how quickly and how far to go.

The attendees at the breakfast roundtable “Driving Innovation with Digital Transformation” held on 22 May at NCS TechConnect at Marina Bay Sands in Singapore, agreed that technologies entering the business environment are provoking significant changes in how businesses are run, and what customers expect.

The discussion started with Mayur Sahni, Senior Research Manager, Services and Cloud Research, IDC Asia/Pacific, presenting the findings of the NCS Solutions for Urbanised Future (SURF) Emerging Technologies Maturity Index 2015 (see page 3).

IDC identifies technologies like Cloud, Mobility, Analytics, Internet of Things (IoT), and Cybersecurity as disrupting the way business is conducted across verticals and will enable the all-important digital transformation that will result in disruptive new businesses, consumer services and business models being built.

“Digital transformation is not a destination. It’s a very long and hard journey all of us have to go through,” said Sahni.

However, there are clear advantages to digital transformation.

“Digital transformation has helped to drive revenue growth – whether it is government agencies looking at digital transformation for better citizen engagement, or private organisations,” said Chia Kok Hong, Vice President, Commercial Large Enterprises at NCS.

“The pain points are similar for both government and private organisations,



CIO DIALOGUE – DISRUPTIVE NEW BUSINESS MODELS

they have to deal with different business and technology silos within the organisations."

Chia observed that organisations know that Big Data Analytics (BDA) is important, but the challenge is to manage the volume of data they receive.

Martin Lim, Strategy and Business Development (CEO Management Office), Bank of Singapore, agreed that organisations today generate a lot of data. He cited a McKinsey study, which found that the data generated in the past two years was equivalent to what was generated in the previous 10 years.

"We have created a lot of data, but 99% of it could be useless. We need to use Big Data with its context, so that the data will not be useless," said Lim.

He also noted that it may be difficult for financial institutions to derive links between data, unlike some other industries. For instance, retail giant Target identified that pregnant women are more likely to browse baby products and buy body moisturisers, and Amazon may recommend "Lord of the Rings" to a customer who purchases "The Hobbit" book.

"We have a lot of data in terms of our clients' portfolio, but there may not be a link between their purchases," said Lim.

Mayda Lim, Director Technology Operations, Real Time, Thomson Reuters Asia (Singapore) said they are facing Big Data challenges, as vast amounts of data is generated by the exchanges, especially the large ones. She said that 8-10 years ago, they used to generate 50,000 updates per second, but there are 2.1 million updates per second today.

"The biggest exchanges like in New York are churning out a lot of data

without them knowing it... you need a certain infrastructure to deal with this data, otherwise the screen will freeze or the data we have is not updated," said Lim.

Manish Joshi, Vice President, Information Technology, Credit Suisse AG noted that there are silos in terms of different business verticals, and a common strategy and architecture is needed. Another point he made was that many financial institutions have the challenge of maintaining legacy systems that require budget spend.

"The elephant in the room is that many banks have legacy platforms to maintain and regulatory requirements to meet, so when there are new technologies, it basically becomes a brownfield experiment. In contrast, younger organisations like GrabTaxi and Amazon don't inherit older systems. They have no baggage," said Joshi.

USING BIG DATA

Big Data Analytics (BDA) is definitely an area AIG looks into, said Biren Kundalia, Regional CTO, AIG APAC Holdings.

"Big Data is a key area. We have a data science team looking to leverage data and data analytics, for internal and external data," said Kundalia.

Internally, data is leveraged to build risk models to apply to insurance policy pricing. AIG also sources for external data that is helpful to make correlations between life events or triggers, such as having babies, getting married, that may trigger the search for a new home or a bigger car and therefore new policy purchases.

Rajamani Gopalakrishnan, Senior Vice President, GCG Core Infrastructure Services, Global E2E

Build Integration Lead, Citibank Singapore, said there may not be a correlation between technology adoption and business success. He noted that some of the most profitable segments of a business may have more low-tech setups, and said that Citibank is going into SOA [service-oriented architecture], by building a layer to connect seamlessly to legacy and new technology.

Bank of Singapore's Lim agreed that sometimes the simple approach may work better than complicated technology. He cited the example of how NASA spent millions to develop a pen that could put ink to paper without gravity, whereas Soviet astronauts simply used pencils.

At Singapore Tourism Board, Big Data Analytics is used to help tailor the marketing strategy for different markets.

"In general, one size used to fit all for the different markets. Now we realise that tourists from Malaysia, China, Europe, seek different experiences. Therefore we have to use the Internet and social media to actively reach out and engage people," said Lim Leh Hoon, Head of Information Systems, Singapore Tourism Board.

MOBILE TRENDS

The digital and mobile economy has created new challenges for organisations. The rapid evolution of mobile technology has made it difficult for businesses to anticipate what will happen 6-12 months down the road.

"The players making a big impact in the mobile space are not the traditional IT players. The stage has changed very significantly," said Chia from NCS.

Besides mobility, the attention paid to and urgency of cybersecurity has



heightened significantly in the last 18-24 months.

"Security experts say that almost every company has some form of breach – it's a matter of whether you know it or not," said Chia.

Social media can provide useful insights, said Credit Suisse AG's Joshi. For instance, 24 hours before something important happens, the volume of Twitter activity goes up.

"Before news comes into the market, social media picks up on that noise," said Joshi.

EMBRACING THE MILLENNIALS

With the unfolding of digital transformation technologies, a digitally savvy generation has emerged. As they become consumers and enter the workforce, they are slowly reshaping the workplace and the marketplace. Organisations like Republic Polytechnic and the Ministry of Defence (MINDEF) have tried to accommodate the different mindsets of the millennials, who tend to be more tech-savvy than previous generations.

Neo Yong Chiang, CIO at Republic Polytechnic said that the students will experience different technologies within the polytechnic as well as when they do their internship in organisations which will have differing levels of technology adoption.

The Ministry of Defence has tried to address the new generation of recruits as national servicemen by providing modes of learning that they are familiar with, such as tablets for learning, said Annie Lim, Head of Information Technology, MINDEF. She also noted that the millennial workforce tends to be more vocal and desire recognition.

The ministry also moved to accommodate these digital nomads. For instance, the army camps are divided into zones, where only the sensitive zones disallow the use of camera phones.

The introduction of new technologies has resulted in new types of products. Thomson Reuters Asia's Lim said that their company product is not a physical object, but information. The challenge is to deploy the technology externally, and whether the market is ready for it.

She opined that another challenge is to be able to think two to three steps ahead of the competition to effect digital transformation that is both "informative and transformational. The challenge is how to best use our digital assets."

IDC's Sahni added that those organisations have used these emerging technologies to lead by disrupting traditional business models. For instance, e-commerce company Alibaba raised the largest bond in China with its ground-breaking US\$8 billion debut bond offering, displaying the same skills that banks have. He also said that providing customers with a mobile view of their websites is important, as those whose websites can't be viewed on mobile browsers might mean lost business.

NEW MINDSET

Danny Ong, VP & CIO, Global Information Systems & IT Infrastructure, STATS ChipPAC, noted a change in mindset with the use of BDA, leading decision makers to take new approaches to problem solving. He acknowledged that gaining insights into manufacturing data can translate into potentially large savings in terms of cost or effort reduction.

"In the manufacturing industry, we

needed clear objectives before we embarked on something in the past. Now with BDA, the returns may not be clear at the outset, but we are willing to try. There may be no returns, but if there are returns it could be huge," said Ong.

NCS's Chia added that organisations can approach data scientists with a clear problem statement to solve, but another approach is to request the data scientist to derive insights, without a clear business problem to be solved.

IDC's Sahni added that 50% of the respondents in the NCS SURF Emerging Technologies Maturity Index 2015 survey are trying to find the business use case for BDA, while another 50% have completed the proof-of-concept and are now trying to scale it up.

Nehal Patel, Head of IS and Asia Pacific Seeds, Syngenta Asia Pacific (Singapore), noted that even companies in the traditional agricultural business are turning to technology to boost yields and manage risk, such as Monsanto's acquisition of the Climate Corp that uses analytics on data like weather measurements and forecasts.

In summary, digital transformation has ushered organisations into a new age where they face unprecedented challenges.

"The best approach is to ensure you have access to all existing and future assets, including legacy systems, customer data and marketing data," said NCS's Chia. "This allows data to be fused, aggregated and correlated, in order to enable better collaboration within the organisation, better customer engagement and drive revenue up."



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