

GETTING SMART

BY JENNIFER JACOBS

Eight years ago, two scuba-diving buddies got to talking about a new technology that they were sure was going to be big. Dave Choong was running a company that helped factories in Penang to set up their IT networks while J M Wang was operating a vehicle-telematics concern that enabled companies to keep track of their trucks.

Their casual conversation on the Internet of Things (IoT) led to them setting up Linear DMS Solutions Sdn Bhd (LDMS) to look into how they could tap this technology. Although it was a bold step, the duo spent the next two years undertaking research.

No one in Malaysia had heard of IoT. If Choong and Wang went ahead with this, they would be pioneers. But this was both good and bad. The good part was that they would not have any competitors in the market. The bad was that it would take time and money to pave the way forward.

They decided to take a gamble. "IoT was going to be a huge thing. Everybody was talking about it — making smart things, smart homes, smart buildings, making everything wireless and IoT-enabled. We decided to help people achieve what they want in the IoT space," says executive director Wang.

The company was set up with three shareholders — Dave Choong, Wang Jiung Ming and Tan Wei Sheng — hence, the name DMS (Dave, Ming and Sheng). Tan left in 2015 to start another venture.

Although the company was established in 2012, it only started operating two years later, with a team of four R&D engineers. After spending 1½ years on research, it decided to go with Bluetooth Low Energy (BLE).

"At the time, no one knew which technology was going to win. We chose BLE because all of our mobile phones are equipped with Bluetooth," says Choong.

Deciding to start a company based on IoT was one thing. Going forward was another. For one, the market had not heard of the technology and was going to require some convincing. This meant that every time one of the partners pitched their idea, the company in question would ask for a "proof of concept" (POC) to see what it was all about. But it would have to be at LDMS' own expense.

This turned out to be a very expensive proposition and the partners poured in their own money to fund this. Luckily, they had other companies that were churning out a profit so they could subsidise the development of LDMS.

In 2015, the company received a matching grant of RM1.1 million from Malaysia Digital Economy Corporation (MDEC) and last year, it got a RM5 million Business Growth Fund loan from Malaysian Technology Development Corporation (MTDC). The loan needs to be serviced after three years.

The duo made some rookie mistakes. "We spent a lot of time and money coming up with a location-based product, @locus, and we talked to mall operators about what indoor navigation could do for them. But after evaluating our product, they decided that they were not interested," says Choong.

"Putting in a location-based service would make it a smart mall. But it did not have any revenue-

generating potential. So, the operators would have to invest without getting any real returns. It was not that our product did not work. It was that it did not sell."

After that, the techies curbed their enthusiasm and proceeded more cautiously. "We knew we would have to create products that helped our clients either make or save money," says Choong.

The other major challenge was putting a team together. "It was hard to find talent as this field was still new. And even if we managed to find people, we had to spend a lot of time and effort training them so they would be productive," he says.

However, the founders had the vision and passion to go on. They stumbled and fell often, but picked themselves up, licked their wounds and soldiered on. As Wang says, the original plan was to help companies in their IoT journeys. But while they were waiting for these companies to catch on, they went ahead and developed their own products as well.

For instance, the company has developed smart-building and smart-home solutions. "We have a three-channel lighting controller called @Nodus Light. We built it specifically to be retrofit into the existing lighting of a building or home to enable smart lighting control, scheduling and monitoring," says Wang.

Choong adds that it was important to develop the product so that it could fit both existing and new lighting installations because most building or home owners do not want to throw out their lighting just to get smart lights. Also, the smart lights tend to be expensive.

"@Nodus Light can also serve as a Bluetooth Mesh communications network to enable data transmission as well as a reader for all Bluetooth beacon tags for asset and human capital monitoring applications," says Choong.

What does this mean? First, a Bluetooth mesh networking system allows a building management company to monitor and control its lights (as well



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LDMS placed sensors in the ponds to monitor the water quality

as other systems). A simple example would be: if the sun comes out from behind the clouds and causes the ambient light levels in a room to get bright, the system turns the lights down, slowly, in real time and people do not even realise what is going on.

But the sensors can do more than just monitor light levels. They can be configured to detect fire, carbon dioxide, specific sounds and other hazards, as well as the presence of people or specific machines in a room (for asset and human capital monitoring systems).

For a more enterprise or industrial take on this, the company has developed @Nodus Light (Read), which is essentially the same product, but with more bells and whistles. "Besides controlling the lights, this application reads asset or ID tags so it can identify specific high value assets or people in the building at any given time," says Wang.

"Imagine that instead of a wearable, it is associated with an expensive asset or good that needs to be constantly monitored. By using a reader, we will know exactly where it is at what time. And if the seal has been tampered with, we will know instantly. You do not need to be there and you do not have to hire a security guard."

Choong says use cases include putting it in a warehouse to keep track of the goods or on children to check whether they are skipping school. "Parents want to know where their children are at all times," he adds.

But won't the children just take it off? "If they do, the parents will know because it has temperature sensors. If the tag does not say 37 degrees [Celsius], that means it has been removed," says Wang.

Another potential use case is in the hospital, he adds. "You can put this in maternity wards where the newborn babies are. There have been cases of babies stolen from maternity wards. But if they were wearing these tags, you would be able to monitor them. And if the tags are cut or removed, an alarm would be triggered and you would know immediately."



(DO), salinity and ammonia content of the water.

Choong also found that it took only four hours to wipe out the entire population of a pond and that it happened quite frequently, usually in the wee hours of the night, when everyone was sleeping. "I asked him how he controlled that and he said they routinely tested the quality of the water in the ponds with handheld sensors. Now, the farm is 111 acres and there are 34 ponds. So, by the time they get all the measurements, come back and tabulate the figures on their computers, it would have taken some time," he says.

Choong then asked what the frequency of testing was and found out that it was usually done once a day, but only if the workers were not busy. "I raised the question of what they would do if anything went wrong with the ponds and he said, they would have some remedies. For instance, if the DO was too low, the entire pond would be wiped out in four hours. It had happened to them before," he says.

If this happened close to harvest time, it would mean a loss of RM200,000 to RM400,000 per pond.

What were the remedies? Switching on the paddle wheels to beat atmospheric oxygen into the water. "In such big ponds, you would need 10 to 12 paddle wheels. So, just imagine how much electricity you would use if you switched them on the whole night just to make sure that the DO levels do not fall when nobody is monitoring them," says Choong.



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However, that was not the only problem. Prawn farms use sea water and when it rains heavily, the ponds become very alkaline and salinity levels fall, which is not good for the fry (baby prawns). "When you breed something, you must have optimal conditions for it to survive and grow," Choong points out.

He decided to see whether IoT sensors could help increase yields and better regulate the overall running of the aquaculture farm. "The major challenges are cost efficiency and a lack of resources and mobility. The lack of data prevents them from learning what has gone wrong and how to improve the situation, detecting diseases and those sorts of things," he says.

LDMS bought sensors to detect pH, salinity, DO and ammonia levels and integrated them with a data logger that it had developed for this purpose. "Basically, we put all these sensors in the pond and they collect data and pump it to the cloud or farm servers. When we hit low parameters, say, the DO is getting low, the farm gateway switches on our wireless programme logic controller (PLC) and it turns on the paddle wheels. So, there is less human intervention, the DO levels go up and the pond is saved," says Choong.

He adds that the company has put in sensors to control the autofeeder, which regulate how much feed is pushed through. "It does not mean that you feed them a lot and they eat everything. When the prawns are small, you do not need to feed them that much."

Regulating the food intake is important not only for the health of the livestock but also because the yield is calculated based on the feed-to-conversion rate. So, it is best not to waste feed. Also, uneaten feed pollutes the water and increases mortality rates.

Another common problem is biosecurity. Often-times, the perimeter is breached by pets or other animals, which may be carrying diseases. "So, we put in motion sensors to detect any movements in the vicinity to alert us of animals straying into the location," says Choong.

LDMS has developed its farm products so it can work in places where there is no proper telecommunications service. "These farms are usually in remote areas so we have carefully designed products capable of forming a local LoRA (long range, low power wireless platform) network on the farm. This way, we create our own network on the farm to minimise dependence on telcos," he says.

This is especially important because, as Choong points out, telcos are reluctant to invest in expensive towers in remote locations, where the payback would be very slow.

Now that LDMS has an aquaculture POC, is it trying to sell it to major aquaculture farms in the country? "The folks at MDEC and MTDC are trying to link us with the big players in Malaysia. And we ourselves are approaching farms, including one in Thailand. This product is fairly new, but we think it has international potential," he says.

Although the company is developing its own products, it has not forgotten its original intention of helping companies on their IoT journeys. The going has been slow but so far, it has racked up a few customers, both local and foreign. They include a major air-conditioner brand, Singaporean and European lighting companies, a Singaporean asset-tracking company (monitors trolleys and forklifts at the airport), a street lighting company and an electric-bike battery manufacturing company. It is also working with a telco to help its customers in the area of smart manufacturing.

The company is involved in some interesting projects. "We are providing consultation services to a port operator for its port transformation programme, where we use IoT to solve its daily operational problems, and helping the manager of a 40-storey building with its security and emergency evacuation process. We are also working on an open space car park project for a factory so its employees do not waste time looking for parking," says Choong.

It has been a long and difficult road. And although the company's products and services are starting to catch on, it has not broken even yet. In fact, if all goes according to plan, they will only break even by end-2020.

But Choong and Wang are not fazed. They have faith in the technology and are in it for the long haul. Theirs was one of the earliest Malaysian companies to go into IoT and they expect to reap the rewards of their foresight and perseverance.

SLEW OF PRODUCTS

The technology is known as the mobile beacon seal and the company has a patent for it. It has developed a slew of products, including the @Nodus Wall (a BLE-powered smart wall switch that replaces conventional on-off switches and does not need cables); @Nodus Gateway (a smart BLE-to-wireless gateway, which enables the sending of data to the cloud server to enable users to control devices remotely); @Nodus Smart Lock and Padlock (enables users to control locks remotely — enabling Airbnb owners, for instance, to accept guests without being physically present); and @Nodus Smart Curtain, which, well, controls your curtains remotely.

Perhaps one of its most exciting developments is in aquaculture. Choong was chatting with one of his golfing buddies, who owned a 111-acre aquaculture farm with 34 ponds in Balik Pulau, when he came up with the idea of using IoT to help the farm increase its yields.

Choong says a lot of aquaculture farmers make decisions based on their own experience and guess-timates rather than cold hard data. "For instance, they see the water turn a certain colour and take that as an indication of its pH or acidity. That is why the mortality rate of their livestock is so high and why so many of these farmers cannot make money."

When he first got into the conversation with his golfing buddy, the latter was reluctant to admit that there were problems. "When I asked him what his challenges were, he said, 'Nothing much.'"

Choong refused to be satisfied with the answer. If there were no problems, why were the yields so low and mortality rates so high?

He probed further and found that there were actually plenty of challenges. First, in a prawn farm, the quality of water is very important. You have to constantly check the pH or acidity, dissolved oxygen