



LTA DESIGN OF CONTACTLESS TOP-COVER
SMART-CARD READER FOR MRT STATIONS

THE ART *of* COMMON SENSE

left:

Alain Dupuis

Commuters today take for granted the ease of tapping in and out of MRT stations when riding the rail network in Singapore. But back in 1998, the norm was slotting magnetic cards into fare gates before passing through to collect them at the other end. Then, it was state-of-the-art technology although it could be a bane during peak hours. Bottlenecks formed at fare gates and were made worse when cards malfunctioned.

With ridership on the MRT steadily increasing after the completion of more lines and stations, the Land Transport Authority had to find a new way for commuters to pass through the gates quickly and efficiently.

The answer came in the form of a smart card that would allow passengers to open the fare gates with a single tap. While LTA engineers could develop the software for what was eventually the EZ-Link card, this meant that fare gates at all stations had to be retrofitted with top cover reader housing that could read the card.

The team turned to a group of engineers from Model 2 Mold which won a tender to design a top-cover smart card reader housing for the EZ-Link card. To achieve this objective, the engineering team led by creative division manager Alain Dupuis had to first establish where to place the interaction points for the smart cards so that riders could comfortably tap in and out of the gates. They had to design it in a way commuters would instinctively know where to tap their cards and see that their transactions were successful.



above:

Original gate with a
RFID reader used by
SMRT personnel

It was a daunting project and behind every engineering feat are countless hours of research, trial and error, and tests. In creating an efficient card reader housing, Alain's team had to consider other factors such as aesthetics, the ideal height placement and at the same time ensure that it could work with both the old and new systems in the course of the transition.

Riding a bumpy road

The project required the collaboration of the Fare Systems and Architecture teams from LTA to develop the concept. From Fare Systems' standpoint, it was critical that the smart card reader housing was extremely durable for daily commuters, and its design intuitive and user-friendly.

"I designed a few models that were quite distinctive, some with lighting elements. But consultation with the LTA led us to further improve and simplify the design," explains Alain. "We went back to the drawing board about five to six times before coming up with one that everyone liked."

One of the challenges the team faced was to embed the transparent display that houses the light indicators onto the body of the card reader. While the original design was for the lights to appear in a dotted line, LTA wanted the lights to appear in a continuous line.

Alain recalls: “We went through a creative process and did a lot of tests over a couple of weeks to achieve the desired effect. We finally solved it by directing the LED towards the stainless steel cover, which diffused the lights, as well as lightly spray-painting the inside of the lens. It had to be a staged process because there’s no single way of doing it.”

The challenge was how to make it cost-effective. To achieve this, they partnered Diethelm Group Singapore to manufacture and install the finished product, while Alain’s team produced the tools and parts, and fine-tuned the lighting system.

“Important lessons can be very adventurous, to say the least,” Alain points out. “In any project, when we get closer to designing a product that meets all the customer’s specifications, the work always intensifies. As engineers we want to keep on improving a design until the very last minute, when we feel it’s perfect.”

Creative and pragmatic

That is why teamwork is crucial. Alain, the chief designer, says he had the support of other engineers, Brian Ling and P V Subrahmanyam, who helped with the mechanics of the cover’s smart reader. “It’s all about supporting one another and bringing in new ideas when a solution needs improvements. This job is not about the work of a single person,” he says. “Engineering is a marriage between common sense and trial and error. It’s about being pragmatic on the technical side of things to give commuters a reliable and user-friendly design in form and appeal.”

Alain and his team may not have introduced any new engineering techniques

“As engineers, we wanted to improve on the design right to the very last minute, until we think it’s perfect.”



above:
3D rendering of
one of the design

below:
Please advise



above:
Concept art of the top-
cover smart-card reader

in their work for the LTA, but he is proud they came up with a unique product. It took a year from the time the team began work to conceive ideas and modifying them before the final product was accepted in 2000 and installed. For 14 years after it was fitted at all MRT stations, it registered more than five billion transactions before it was slowly phased out for a newer design for Cepas, the next generation of smart cards.

Deborah Wong, who was LTA project manager then, acknowledges: “Alain and his team worked tirelessly to achieve the very demanding and stringent requirements specified by LTA necessary for the fare gate system serving the public transit masses.”

This project was a huge achievement for Alain and his team of engineers. They answered the call to ease the flow of thousands of commuters riding the MRT every day across Singapore. It was work commuters may have taken for granted, but indispensable in meeting a need at that time.

“It is clear engineering plays an important and critical role in our lives every day, and it is necessary for the profession to get the credit it deserves,” muses Alain. “Engineering is often seen as unglamorous and lacking in rewards, but this isn’t really true. Most time, no one talks about the work we do and it is ironic that most engineers are also underappreciated when they bring important benefits to society.”

A looming new day

While software engineers are gaining more prominence, Alain laments that the likes of mechanical and structural engineers have been removed from the spotlight. It is a far cry from the 19th century, when these engineers and their work were celebrated for improving the lives of society.

But he also hopes to see more students taking up engineering. “It’s all about passion. If you’re passionate about designing products that can improve people’s lives and you have creative impulses, you should go into engineering. The profession is often about work that is for the common good of society.”

Alain is optimistic about the future of the profession in Singapore. Engineering here, he observes, has evolved over the years. When he first arrived 19 years ago, one of the biggest issues was the lack of creativity within the community. There were capable people but many erred on the safe side.

“But now the new generation is bolder, more daring and willing to try new things,” says the Singapore permanent resident. “The startup landscape in Singapore is also becoming very exciting, it’s really exploding, and that’s a good sign.”