TREK 2000 INTERNATIONAL
REINVENTS ITSELF AS A GLOBAL TECHNOLOGY PLAYER

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¹This case study was written based on a face-to-face interview with the founder, Chairman and CEO of Trek2000, Henn Tan.
In 2000, Singapore company Trek 2000 International launched the world’s first thumb-sized USB-compatible and smallest external storage device for computers. By 2008, the ThumbDrive that it invented and further developed had replaced the ubiquitous floppy disk as the common portable computer storage device worldwide. Beyond the ThumbDrive, Trek’s research and development (R&D) team had invented other products that were helping to improve people’s lives around the world – the Flucard secure digital card with wireless capability (another world’s first) and the miniature Ai-Ball video camera with wireless capability (world’s smallest) launched in 2010 and numerous enhanced versions since then, among many other innovations.

Like other technology start-ups, Trek had its fair share of problems and challenges with new product development, intellectual property protection, production and market development. It had overcome many of them, but some remained insurmountable. Since 1995, Trek had been reinventing and re-organising itself as a sustainable business in its continuing efforts to protect and monetise its intellectual property, ride on the wave of emerging technologies and differentiate itself in an increasingly competitive world market. New products and extended product lines were continually being developed by this Singapore enterprise. To support its innovation, R&D was carried out in five countries. Leading the technology-based company was its founder, Chairman and CEO Henn Tan.

It all started in 1992, when Henn realised that a corporate job might not suit his entrepreneurial nature and that the only way he could avoid being retired at age 55 was to work for his own company.

Creating his own life-long employment opportunity
In 1992, at age 35, Henn worried about retiring at 55 as a Sanyo employee with five mouths to feed, although he was working hard like his Japanese bosses to stay relevant, with only a diploma qualification then. He was concerned about his children’s future education. He asked for equity participation in the company with no retirement as his only condition. Although his request was turned down after his meeting with Sanyo’s president in Japan, he was disappointed but proud and determined not to be retired at 55. He turned down job offers from Samsung and Motorola as joining them would also mean retiring at 55. After his request to Sanyo for posting to the US was not granted, he wanted to start his own business. However, he had to wait a few years before he could do so as his daughter became seriously ill. He had to use up all his life savings and spare time to see to her full recovery, and stayed the course in pursuing his career goal while studying part-time for his Bachelor of Science degree in management from the University of Ireland, from which he graduated in 1994.

In 1995, when he was turning 39, Henn decided to become an entrepreneur as he did not think that he would have the energy to start his own business after the age of 40. He considered setting up a new enterprise of his own but preferred an established company with a recognised name and existing customer base. He bought a small, local family-owned electronic parts trading company for SGD one million without any financing as he had negotiated with its owners to pay them by instalments, with the first partial payment to be made six months after the purchase. Within two years, he was able to make full payment. His former employer, Sanyo, had also extended him a SGD one million credit line for purchasing components.
After taking over the ongoing business, Henn restructured the company and changed its focus to providing technology-driven engineering solutions to businesses. His company’s first big break came in 1998, when it was appointed as a design house for Toshiba of Japan, to provide engineering support to Toshiba’s customers who lacked engineering resources.

In 2000, Henn renamed his company Trek 2000 International and listed it on the then Singapore Stock Exchange in May that year. “Trek” in the new name reflected its long-term business commitment while “2000” indicated its year of public listing and “International” its plan to become a global company.

**Building a sustainable technology business**

As Trek’s tagline “Innovation: Inside Out” suggested, it was in the business of dreaming up innovative ideas, nurturing them into engineering concepts and turning them into tangible products and useful applications to enhance consumers’ lifestyles.

Since founding Trek 2000 International, Henn believed in building a sustainable business by constantly coming up with innovative products and solutions that improved people’s ways of doing things. This required leadership, new product development (seeing and seizing opportunities, generating product ideas and R&D), intellectual property protection, production, market development and strategic business development.

**Leadership**

Henn had transformed the small trading company that he bought into a publicly listed company that invented the world’s first portable USB flash drive and the world’s first wireless secure digital card. In the process, he also transformed people – Trek’s employees and its customers. He strove to cultivate a company culture that inspired his staff to think of bold and big ideas like him. He constantly encouraged his R&D team to fearlessly pursue their dreams of inventing new disruptive innovations. His personal values, determination to succeed and resilience in overcoming overwhelming odds showed the way for their efforts in transforming engineering concepts into products.

Although he did not have a technical education, Henn had learned much about technology and its applications from his field information and intelligence while working at Sanyo. In addition, his part-time university education had facilitated his thinking process and enhanced his management skills.

To motivate his staff to achieve a desired outcome, Henn practised management by objectives, with the end goals of all projects clearly defined and set by both management and the respective teams in the company. The approach helped him to align each team with a common goal, communicate and delegate responsibilities more effectively, and work together with team members towards the same outcome. He inspired others by his example. His passion to be a game changer in the technology industry spurred his staff to share the same passion.

As a business leader, Henn embraced and practised meritocracy in his company. He believed he could generate more breakthrough solutions if he focused on new product development and left Trek management to another CEO.
It was Henn’s vision that the future of technology in Singapore lay in harnessing the Internet of Things (IoT) to advance society and set new global benchmarks within the technology industry. From his perspective, leveraging on IoT to become a smart nation entailed the seamless connection of the whole of Singapore in order to transform the way people lived, worked and interacted.

**New product development**
The life-blood of Trek was innovation. At the heart of its innovation was R&D, which created value and differentiated the company. For Trek, Henn’s leadership of its R&D was crucial. For Henn, relentless innovation was critical for success due to the short product life cycle in the technology business. The R&D team of nearly 50 members were mostly engineers who were passionate and dedicated to their professions. Their expertise was in solid-state drive (SSD), embedded multimedia controller (EMMC) and embedded multimedia chips (EMCP), among other areas. Their R&D experience over the years had provided important insights into and intelligence on practical devices and useful applications for consumers.

R&D works were carried out in Trek’s R&D centres in Singapore, Malaysia, Thailand, Vietnam and India to tap into their areas of excellence, with core development in Singapore, hardware in Malaysia, software in Thailand and India, and firmware in Vietnam. Their R&D efforts, coordinated through weekly meetings via Skype video-conferencing, had resulted in numerous patents covering portable storage devices, anti-piracy software, centralised management systems, compression, wireless, USB and security/encryption solutions, as well as PC and mobile applications. Henn attributed their prolific output to human factors. They kept themselves abreast of global technology and market developments by being open to learning and exposing themselves to emerging technologies, to ensure that the company continued to be relevant. They were also updated through Trek’s strategic collaboration with technology partners, and from customers’ feedback and equipment/component vendors’ road maps. Participation in major technology events also helped to keep them informed of the latest global developments and trends.

The key stages in Trek’s R&D process included conceptualisation, feasibility study and proof of concept, which involved testing it among some loyal customers. The company’s product development process is shown in the diagram in Appendix A. A crucial step was the filing of patent for the concept to be developed into a product. Once a concept had been visualised, Trek’s patent attorney was asked to proceed with patent mapping to ensure that the concept had novelty. With countless number of granted patents swirling in cyberspace, certain or close similarity to other claims might be cited. If such prior art was discovered, any conceptual differences would be compared. Only when the features and functionalities of Trek’s product concept were found to be distinctively different from those of the prior art would the filing of patent follow. If they did not appear to be distinctive, the R&D team would relook at the whole concept meticulously and work on improving its novelty factor.

The thought of creating a differentiator in the technology industry had motivated Henn to develop the world’s first thumb drive, which he conceived in early 1999 when he was asked by Toshiba to reduce the form factor of an earlier product (portable MP3 player). He saw such a differentiator as critical to Trek’s business success, as it would enable the company to negotiate with other
companies at an eye-to-eye or equal level, rather than from a bottom-up or inferior position. (Such creativity in business was in a way similar to his personal choice of standing out among others when he was a school boy who had spent hours manually embroidering the back of his pair of jeans to attract attention.)

He was also inspired to conceive the ThumbDrive as he wanted to create a proprietary solution that his company could claim as its own. He saw the possibilities presented by the USB (universal serial bus) of every computer in the world. After setting his mind on developing the ThumbDrive, Henn and his R&D team wasted no time in starting work on its development.

As a policy, Trek developed products and applications that were both patentable and commercially viable.

First breakthrough – a world’s first with the ThumbDrive
In 2000, true to the company’s focus on technology-driven engineering solutions, Trek launched the ThumbDrive, the world’s first and smallest portable storage USB flash drive that could store virtually any digital data (from documents and presentations to images, audio and video files). Its first version was about the size of a car key and comprised a flash memory with four MB capacity and USB interface for insert-and-play connection to a desktop or laptop computer – without the need for software, wire or battery.

Henn considered a few other possible product options before choosing the ThumbDrive as the one for his R&D team to work on. He picked it as the one with the greatest business potential because there was already a huge market for it. The first ThumbDrive was developed entirely by the R&D team in Singapore.

Following the launch of the first ThumbDrive in 2000, Trek’s R&D team worked on enhancing its features. In 2001, Trek released the ThumbDrive Touch, which was the first of its kind in the world to use biometrics (fingerprint recognition) technology for accessing stored confidential information at the touch of a finger, without the need for bothersome passwords. It also launched the ThumbDrive Smart that did not require drivers and installation procedures. Both ThumbDrive products offered higher storage capacity of eight MB to a whopping 512 MB at that time.

In 2003, Trek and NEC of Japan jointly developed a new chip to improve the performance of ThumbDrive Smart by 10 times, thus achieving a breakthrough in the USB 2.0. The ThumbDrive Smart was expected to meet increasing consumer demand for higher-capacity and faster audio and video storage devices. That year, the ThumbDrive Touch was adapted for use in Singapore’s Thermal Imaging Scanner System to detect abnormal body temperature during the SARS outbreak.

The development of the ThumbDrive SAKE (storage, anti-piracy, key and encryption) in 2004 was significant for online content providers, whose contents would be protected and disseminated to the rightful owners. At a new ThumbDrive product launch in 2005, Henn announced that the device would be incorporating encryption features to address the higher security needs of users.
In anticipation of the new IEEE 1667 standard being incorporated in the operating systems of computers, Trek developed the first SSD IEEE 1667-compliant ThumbDrive product and released it in 2008.

By 2015, the R&D team had developed many other ThumbDrive products to suit different needs. (See Appendix B.)

**New wireless storage technology**
At Trek’s launch of its new wireless storage technology in 2007, Henn asked those present to imagine the convenience and efficiency offered to consumers by a new generation of home appliances and surveillance systems that could store a huge amount of data to be used for operating these equipment. He foresaw homes of the future having various types of wireless communication equipment that were synchronised and supported by Trek’s wireless storage technology. As he had pointed out then, the possibilities were only limited by the imagination.

As the world gyrated rapidly towards the adoption of that leading-edge technology, Trek had already created the conduit to share it with its partners globally. Yet, Henn was already thinking of protecting the data stored in the system as the next step for Trek to work on, to enhance the power of the new wireless storage technology.

**Second breakthrough – another world’s first with the Flucard**
In 2006, during Henn’s family holiday, a camera containing many memorable photos was lost. That experience set him thinking about how to solve this unhappy situation for other people. He imagined snapping a beautiful picture during a holiday, and sharing it with loved ones at any time and sending it to his blog using his smartphone. He conceived the Flucard idea in 2008.

In January 2010, Trek unveiled its proprietary Flucard, a secure digital (SD) card with wireless capability that was developed by its R&D team in Singapore. Henn picked it as the one with the greatest business potential as he saw its potential to replace the dumb SD card. (He chose the name “Flucard” as he hoped that it would be “contagious” and spread across the market like the flu.) It could be used with any digital device with an SD card slot. With the Flucard, users in different locations could share images with each other and with a community of users. Before it came along, the transfer and sharing of images were done using a wireless router or Internet connection. Later that year, the Flucard was launched in Japan and introduced at the Photokina show in Cologne, Germany.

In 2011, the company launched its high-end Flucard Pro, a wireless SD card that offered existing cameras the storage capacity of an SD card while transforming them into wireless devices for taking, storing and sharing photos. Other enhanced versions followed. (See Appendix C.)

In 2013, Trek and Panasonic Systems Asia Pacific launched their joint-venture Cloud Stringers, which offered its Flucard-based service that was developed in Singapore and Thailand. Its
cloud platform linked photographers and journalists with media buyers in the broadcasting industry. In 2014, Toshiba invested in Cloud Stringers for a 15.26 per cent stake.

Also in 2013, Trek introduced its customised Flucard solution for Ricoh Imaging’s new flagship Pentax K-3 digital SLR camera, which could be operated using its user’s smartphone. In the following year, the Flucard installed in Ricoh’s new Pentax K-S1 Sweets Collection camera line connected it wirelessly to smartphones and tablet computers, and captured and downloaded photos in real time while automatically uploading them to the Flucard portal as a back-up.

In 2014, the new-generation FlashAir (Flucard made by Trek for Toshiba) was developed to upload photos and videos stored on the card directly to the Cloud Stringers portal.

Beyond the seamless and wireless transfer of photos, videos and other digital files among users, the Flucard offered many other applications, such as file uploading to cloud storage, consumer home entertainment, medical devices’ monitoring of patients’ vital signs, office productivity and bridging of hardware through scalable software. Trek also explored the use of the Flucard in car entertainment systems with the manufacturers of car parts.

Third breakthrough – Ai-Ball, the world’s smallest remote camera
In October 2010, Trek released its breakthrough product, the Ai-Ball, which was also developed in Singapore. Measuring only 30 mm in diameter, it was the world’s smallest standalone portable wireless remote camera, with video viewing of up to 20 metres. It was targeted at consumers and addressed the needs of youths who grew up sharing videos online through blogs and other social networking channels. Computer and smartphone applications included robotic toys, security and utilities. (See Appendix D.)

Trek developed the Ai-Ball camera using its advanced design capabilities and patented wireless solutions to stream continuously, wirelessly. The company started to explore its commercial applications across various industries. At the Ai-Ball launch in 2010, Henn requested his audience to imagine the day in the near future when police officers carried the Ai-Ball as part of their gear when they went on their rounds. They no longer needed to rely on sketch artists or their memory for details of crimes or suspects, as what they saw would be sent directly to the police headquarters for immediate processing.

Intellectual property protection
Before embarking on any product development, Trek applied for the necessary intellectual property (IP) protection – patent or trademark – to be granted by the relevant authorities across the world. IP protection to safeguard its proprietary technologies and licensing revenue streams was very much a part of its risk management. It involved various measures – preventive (patent and/or trademark application), detective (investigation of possible infringement) and corrective (legal action).

The company realised that important factors in formulating its patent strategy and in deciding on its IP management approach were the legal environment and enforceability of IP rights. In 2006, after years of perseverance and belief in its solutions and IP ownership, Trek started to realise an improved revenue stream from its library of IP assets.
Trek worked with reliable and trustworthy contract manufacturers to safeguard its IP rights during the production process. It had an in-house legal team. Wherever possible, it worked with its large overseas partners to protect its IP and to enforce its IP rights against any infringements.

As of September 2015, Trek owned a portfolio of 436 granted patents. These were registered with the names of Henn and some of his R&D team members.

**ThumbDrive**

The ThumbDrive itself was only a basic device that could be configured into many applications. For example, it could incorporate identification and security functions for use in healthcare, education, security and other industries. Its vast potential in business made it necessary for Trek to invest in and protect its IP ownership. Trek worked with Toshiba’s in-house lawyers to enforce its IP rights for the ThumbDrive, thus reducing its own legal costs.

In February 2000, Trek filed its patent application for the first version of its ThumbDrive in 36 countries. Soon after its launch, the ThumbDrive became popular among computer users and generated immense interest among technology companies. In his eagerness to work with strategic partners, Henn shared the ThumbDrive technology with some of them before the patent was granted. Similar devices soon flooded the market in many parts of the world. For example, there were those produced by a Chinese company Netac Technology, which claimed that it had invented the USB flash drive in 1999 and was granted a Chinese patent for it in 2002.

In 2002, the ThumbDrive patent was registered globally and its name trademarked. The patent covered products that encompassed a single device incorporating flash memory, micro-controller units (MCU) and USB plugs on a printed circuit board (PCB). Trek received approval for the ThumbDrive design patents in Singapore, Malaysia, Japan and US for the generic and biometric versions. The Intellectual Property Office of Singapore granted Trek its first ThumbDrive patent for its basic product.

In 2003 and 2004, ThumbDrive patents were in approved in Singapore, Namibia, UK, South Africa, Nigeria, Lebanon, Bahrain, New Zealand, Mongolia, South Korea, Brunei, Myanmar, Oman, Qatar, Australia, Bangladesh, Iran and Syria. They included the patent for its Email On-the-Move software, which allowed ThumbDrive users to download emails from different computers without leaving any trace. As of 2004, Trek had 23 ThumbDrive patents registered in more than 65 countries.

In 2005, the US Patent and Trademark Office granted Trek the patent for its “portable data storage device having a secure mode of operation”, its first US utility patent and the fourth worldwide. Trek also received patent approval for its compression technology, which was embedded into the ThumbDrive, in UK, Japan and Taiwan, as well as for its SAKE technology in UK.
In 2006, Trek registered its ThumbDrive patent and trademark in China and India, where the fast-growing number of computer users would potentially translate into high consumer demand for ThumbDrive solutions.

**Flucard**

After his experience with the first ThumbDrive patent, Henn was quick to get the Flucard patent granted first before releasing it on the market. It applied for worldwide patent in 2008 before the product was launched in 2010.

In 2014, the Flucard was granted a 20-year patent worldwide that excluded others from making, using, offering for sale or selling the Flucard invention, with exclusive protection in US, UK, European Community, China and South Korea. The patent extended to the entire ecosystem revolving around the Flucard capabilities.

Unlike the ThumbDrive, Trek had yet to enforce its IP rights for Flucard patents in 2015 and was waiting for the optimal time to do so.

**Market development**

The company’s full name Trek 2000 International suggested its international ambition to be a global technology player through its innovative products and services. It welcomed strategic partnerships with other leading industry players to boost its market share. The company had sales and marketing offices in Singapore, Malaysia, Thailand, Vietnam, Philippines, Hong Kong, China, Japan, India, Australia, Netherlands and US.

As of 2014, Trek’s key markets were ASEAN countries (accounting for 48 per cent of annual revenue) and China (35 per cent). China’s contribution to its annual turnover increased to over 60 per cent in 2015. The other significant markets were US, Japan, India and Europe, where Trek’s R&D capabilities in data storage and encryption were attracting the interest of multinational companies (MNCs). Henn’s strong reputation among major Japanese MNCs and Trek management’s familiarity with Japanese customers’ expectations had helped to lower the entry barrier to the Japanese market and to entrench the company’s products there.

Henn attributed the high demand for Trek’s products in China to the alliances it had formed with large retailers in the country. In 2000, Trek incorporated wholly-owned subsidiaries in China and the Netherlands. In 2003, it set up a representative office in Tokyo, Japan.

In 2002, Trek expanded its global distribution network with the addition of the US retail chain CompUSA, Hewlett-Packard shopping site hpshopping.com and City Circuit stores. Its original design manufacturer (ODM) deal with Eutron of Italy that year marked its first ODM foray into Europe.

In terms of business segments, the Interactive Consumer Solutions (ICS), which included ThumbDrive and Flucard products, contributed to more than 80 per cent of Trek’s annual turnover between 2010 and 2013 and was forecast to rise above 90 per cent from 2014. RHB Securities Singapore (formerly DMG & Partners Securities or OSK-DMG) had estimated that Trek’s annual Flucard OEM revenue would double between 2014 and 2015 and increase by 50 per cent between 2015 and 2016.
After Creative Technology acquired a 10.1 per cent stake in Trek in 2004, Trek was expected to have access to Creative’s global sales and marketing network.

**ThumbDrive**

After filing its patent application for the first ThumbDrive in 2000, Trek unveiled this revolutionary product at the CeBIT international technology fair that year in Hanover, Germany, where it received an overwhelming response. It decided to market the product on its own instead of partnering established players or multinational corporations, and managed to secure new corporate customers that included JIT (now Flextronics), PCI Limited and Allied Technologies Limited.

Many potential partners approached Trek to explore possible collaboration. In March 2000, Trek began to market the ThumbDrive to original equipment manufacturers (OEMs) and original design manufacturers (ODMs).

In 2001, Trek concluded a deal with IBM to supply its ThumbDrive for the IBM 32MB USB memory key used in its ThinkPad and NetVista computers, and signed a major contract with California-based Sonnet Technologies to supply its new Piccolo ThumbDrive for the Macintosh platform.

In 2002, Trek’s US subsidiary, Trekstor USA, forged a strategic partnership with iGo Corporation, a leading US mobile and wireless accessories provider, to market the ThumbDrive under its RoadWarrior brand name in the US. The company clinched contracts worth SGD five million annually for its ThumbDrive products with US retailer Circuit City Stores and Eutron, a leading Italian provider of information security solutions. During the year, IBM again chose the ThumbDrive Smart technology for its new Memory Key line. More leading international IT companies approached Trek for licensing rights to integrate the ThumbDrive into their existing products. Trek clinched OEM agreements with Memorex, Acer, IBM, Sonnet and iGo.

In 2003, Trekstor USA adapted the ThumbDrive Smart for uploading with IBM’s WebSphere sales presentation and marketing application. Trek also won a contract to supply Iomega Corporation with its USB 2.0 ThumbDrive products of 128 MB to one GB capacities that were sold under the Iomega brand. It signed a non-exclusive ThumbDrive licensing agreement with Billionton Systems Inc of Taiwan that was based on an upfront fee and sales royalty.

In 2004, Trek secured a USD 10 million contract from TEAC Corporation to manufacture ThumbDrive products under OEM for sale under the TEAC brand through TEAC’s global distribution network. It also signed a licensing agreement with Toshiba Corporation, which was supplying its NAND flash memory chips to Trek, for the manufacture and sale of ThumbDrive products.

In 2005, Trek signed a 10-year agreement with Imation Corporation to grant the latter global sales, marketing and distribution rights to its ThumbDrive products. It partnered Innova Card,
a provider of secure hardware and software solutions for terminals, to design a highly secure USB token as an advanced version of the ThumbDrive. That year, computer maker Lenovo selected ThumbDrive Smart for expanding its ThinkPlus USB 2.0 Memory Key line.

**Flucard and Ai-Ball**
Right from the start, Trek partnered Toshiba, the world’s largest SD card manufacturer and supplier, as its Flucard distributor. It earned the approval of the California-based SD Association (SDA) for the Flucard to be used with all cameras and other consumer electronic products. The iSDIO card was the world’s first SD memory card that complied with the SDA standard based on Flucard specifications.

In 2011, Trek appointed Kaga Electronics, one of Japan’s largest consumer electronics distributors, to distribute the Flucard and Ai-Ball in the country. It was a turning point for Trek, as the Japanese, known for their discerning taste, took to both products, with Nikon and Ricoh (Pentax) adopting them for their cameras. Flucard was also installed in Panasonic and Olympus cameras. That year, Trek introduced Flucard and Ai-Ball at a software developer seminar in Japan that was attended by many developers specialising in iPhone, Android and other mobile applications, and digital camera manufacturers. It also started to deliver customised Flucard to Plus Corporation, maker of digital projectors and electronic copy/whiteboards, which allowed users to write, scan and print with a built-in printer. When the customised Flucard was inserted into the SD slot or USB interface of the copy/whiteboard, the contents on it could be scanned and stored in the Flucard and shared wirelessly with different devices like desktop and laptop computers, and smartphones instantly and simultaneously.

In 2012, Trek launched the Flucard and Ai-Ball in the US at CES (previously known as Consumer Electronics Show), the world’s largest consumer technology trade show. The same year, it signed an OEM agreement with Toshiba to supply it with customised Flucard under the FlashAir brand for exclusive use with Toshiba cameras.

In 2014, the company clinched a USD 25 million contract to supply Flucard memory modules for Rely/Mattel China’s children’s educational interactive devices. That market segment was expected to be Trek’s main growth driver for 2014-2016. In 2015, Trek won its second deal from Rely/Mattel China worth USD 50 million to supply Flucard memory modules and Ai-Ball remote cameras for its interactive toys. Besides the US, Rely/Mattel also made the interactive toys available in Latin America.

In its efforts to help develop the industry, a member of Trek sat on the board of the SD Association, the global ecosystem of companies setting industry-leading memory card standards. While the Flucard had not yet become the de facto standard for SD cards, Trek’s R&D team was working on reducing the four-chip solution used for the Flucard to a one-chip solution. The development and the economy of scale would slash its production costs to a level where the Flucard would replace the conventional SD card in the long term.
In the longer term, Trek planned to build an ecosystem of applications and hardware around the Flucard to drive recurring income, such as digital imaging (like Cloud Stringers), office automation, consumer electronics, security and medical devices, and smart interactive toys.

**Cloud Stringers**
Trek was the majority shareholder of Cloud Stringers, which provided a digital marketplace for news videos and images to be uploaded (using Flucard-enabled cameras worldwide), purchased and downloaded, with encryption, data redundancy and watermark security features.

In 2014, Trek and Panasonic jointly promoted Cloud Stringers’ photo/video digital marketplace at the National Association of Broadcasters’ trade show in Las Vegas, US. That year, more than 30 broadcasters from Indonesia, Thailand, Philippines, Vietnam and India signed up for the service.

In 2015, Cloud Stringers signed up News Connect Broadcast Thailand and Ho Chi Minh City Television to provide its enterprise service to streamline the storage, purchase and downloading of the broadcasters’ digital contents. It was appointed by Kiteboard Tour Asia (KTA) to be its exclusive channel for photo and video coverage at all KTA events – users could store, view, share, exchange and transact the contents recorded.

The company was exploring the feasibility of generating revenue from commission for transactions on the Cloud Stringers platform.

**Strategic business development**
Trek operated on an ‘IP-centric’ and asset-light business model, while constantly adapting and evolving in response to advancing technology, changing market and emerging competition. Trek outsourced the manufacturing of all its products to contract manufacturers in Indonesia (Batam) and Taiwan, to stay manpower-lean. It stayed on top of the next technology waves by producing more game-changing products. It focused on building and owning a comprehensive patent portfolio based on a well thought-out procurement strategy. As Trek’s patent portfolio and the industry’s respect for IP grew, so did its licensing revenue. It owned more than 600 patents for products and solutions developed by its R&D team, with over 400 of them represented worldwide, and the ThumbDrive global trademark. Its Flucard was protected by a worldwide patent. It leveraged on its IP to foster strategic relationships and partnerships.

It also used other companies’ technologies through cross-licensing. For example, it expanded its business relationship with Toshiba by sharing each other’s patents for controller technology without monetary transactions.

Following the company’s robust legal actions to protect its IP, manufacturers of ThumbDrive products were paying licensing fees to Trek, thus providing it with another regular revenue stream.

In 2002, Trek formed a joint venture company, InfoWave Pte Ltd, with Melodeon Inc and CET Technologies Pte Ltd, a subsidiary of Singapore Technologies Electronics, to market, develop and
supplies wireless and mobile computing products to the global market. Trek worked with InfoWave on joint product development and cross-licensing of technologies to OEM/ODM customers.

In 2004, Trek invested in Data Computer (2003) of Thailand, with which it planned to strengthen its R&D capability in anti-piracy solutions, Internet purchase gateways and enterprise system solutions. It would serve as a base for Trek’s expansion into Thailand and its neighbouring countries. As part of its strategy to grow its China business, Trek invested in Tracer Technology (Suzhou) for a 20 per cent stake in 2008.

From 2006, Trek had been re-organising itself to adapt to the latest market needs and changes, and to ensure its future growth. That year, it changed its Digital Technology segment to Mobile Media Solutions (MMS) to reflect its focus on portability and storage media, in line with its IP portfolio. In 2014, MMS was rebranded as Interactive Consumer Solutions to reflect its new business strategy.

In 2009, Trek joined the RSA Secured Partner Program, a formal certification that tested and validated products that used RSA’s two-factor authentication and encryption technologies.

In 2014, the company invested in a joint venture (JV) as a majority shareholder with Unimicron of Taiwan to produce solid-state drives (SSD) for portable consumer electronic products. The JV, UniMemory Technology, leveraged on Trek’s R&D experience and technology expertise in SSD, embedded multimedia controller and embedded multimedia chip for such applications. Consumer SSDs were steadily replacing low- and mid-range hard disk drives, and global demand for them was projected to be worth USD 20.7 billion in 2016, with higher SSD adoption in ultrabooks, ultrathin PCs, tablets and mobile devices over hard disk drives.

As of 2015, Trek derived a large portion of its total revenue from its interactive consumer solutions, underscoring the importance of new product R&D, IP protection and market development. It also provided customised solutions to suit customers’ specifications, needs and requirements, such as firmware, modules, total solutions, software, portable storage, power management, microcontroller and medical solutions.

As an R&D company, Trek’s international business development strategy was simple – come up with more innovative products and solutions for the world market.

In 2015, Trek and its strategic partner in medical technology, Osim International, which is a significant Trek shareholder, filed three new patents as a result of their joint product development in wellness and healthy lifestyle products.

Trek intended to ride on the next waves of growth in cloud, medical and consumer wearable technologies in the IoT through more Flucard applications. (See Appendix E.) It was exploring more opportunities through strategic partnership with MNCs on possible collaboration for developing and commercialising new technologies and products. For example, Henn foresaw patients’ medical conditions being monitored by Flucard-enabled devices, and the information uploaded seamlessly to the cloud for doctors’ access and diagnosis.
Overcoming and learning from many challenges
Henn and Trek faced many challenges before and after he ‘restarted’ the existing company that he bought to redevelop as his own business.

Starting and growing his own company
When he started out as his own boss after purchasing the existing trading company, Henn had difficulty recruiting good staff and convincing big companies to engage its services. To attract suitable employees, he openly shared his vision and business objectives and provided them with the opportunities to be exposed to areas that would make them relevant in the technology industry.

To win over large organisations as Trek’s customers, Henn assured them that it was not a one-product or one-solution company, and that it had a feasible plan to grow and sustain its business in the long run.

Developing new products
Fundamental to new product development was market acceptance, which remained a challenge for Trek. Sales and marketing in collaboration with large established technology players as its partners thus assumed an important part of the company’s market development efforts.

In its joint product development with Innova Card, Osim and other partners, the common challenge encountered by Trek was communication among the staff involved. This was overcome by getting the teams from both sides to work together closely and collaboratively.

Not all of Henn’s new product ideas saw the light of day. One practical challenge was the availability of suitable components for new products being developed. For example, Henn had already planned to replace the ThumbDrive in 2005 with the Kiss Drive that was designed to slip onto the forefinger. However, the R&D team could not find a suitable battery that would fit its form and size to power the device.

Another challenge could be posed by the claims of value-adding partners in joint product development. Henn cited the EduPad e-learning platform in Singapore as an example. When Trek sought to receive a recurring fee from each tablet user for its contribution to the product, the other partners like StarHub and National Library Board also asked for it. In the end, the various fees added up to a sizeable amount and the subscription cost was just too high for the service to take off in spite of the Ministry of Education’s funding.

Protecting intellectual property
Trek needed to protect its IP at the concept and design stages of its product development. While the design patents took a shorter time for approval, it might not fully prevent clones from entering the market. However, they would discourage cloning due to their legal implications. Henn learned from his ThumbDrive experience that he should introduce a new product to the market only after its patent had been approved. Since then, Trek had been building up its library of core IP patents, which were strengthened with augmenting patents for new features to enhance existing products, to further protect its IP.
Patent application and approval was often a tedious and time-consuming process. The patent offices of the different countries always conducted global IP mapping and compared new concepts and designs with any pre-existing ones for possible similarity. Trek always strove to be novel in its innovations. With a high novelty factor, it was always easier to earn approval for its patents.

Taking legal action again patent infringement was costly for the company as well as disruptive and time-consuming for Henn and his management team. But this taught him the importance of partnering a large MNC to enforce its IP rights. As a small and medium-sized enterprise (SME), it was more challenging to take on competitors that were much larger in size.

Henn discovered that copyright laws might be interpreted differently in different jurisdictions by different companies. There were also language barriers in different countries that did not use English as the legal language and might interpret the terms used (in English) differently. The lawyers and judges might not have sufficiently deep knowledge and understanding of how the different technologies worked. It would thus be difficult to enforce its patents overseas, where IPs were territorial and legal cases were often fought differently on different grounds.

In 2006, Trek started to work with Microsoft to set up a new marketing platform to differentiate and enhance its IP.

Trek unveiled its new wireless storage technology in 2007 only after patents were granted in Singapore, UK, European Union, South Korea and Taiwan. The patent coverage was extremely broad, with stipulation that the transceiver might use any existing or future protocol and there was allowance for the storage device to receive/transmit in multiple formats.

**ThumbDrive**

For the ThumbDrive, Trek launched its website with the address thumbdrive.com to ensure that it was recognised as the original creator of the USB flash drive by both consumers and the IT industry.

In 2002, Trek’s Singapore subsidiary started legal proceedings against M-Systems Flash Disk Pioneers Ltd of Israel and three Singapore companies, FE Global Electronics Pte Ltd, Electec Pte Ltd and Ritronics Components (Singapore), for infringing its ThumbDrive patent. In 2005, the Singapore High Court ruled in Trek’s favour. It held that the patent was novel and inventive, and dismissed the counter-claims filed by the four companies. Later that year, the three Singapore companies lost their appeal in the Singapore High Court. The suit took more than three years, during which Trek had to incur substantial costs, time and resources as well as many opportunity costs to prove its legal ownership of the patent despite the fact that it was lawfully granted ownership in 2002. In 2006, the Singapore High Court awarded Trek SGD 1.5 million for costs and disbursements that it had incurred, as part of the full settlement.

Henn had learned from his experience that money was might when it came to taking on a large company that was well-funded and determined to gain IP rights from a small player like Trek, either by buying over the business or through other mutually beneficial arrangements.
The alternative was for Trek to put up a costly and long-drawn legal defence against the large company’s legal challenge in many countries, something that Trek could not afford to do.

In 2006, the Patent Office of UK revoked Trek’s ThumbDrive patent for its cable-free connection with host (patent feature) in the country, following legal proceedings raised there. Trek’s lawyers appealed and challenged the view that it was not a storage device but could not convince the UK Court. In 2008, the UK Court rejected Trek’s appeal to reverse its earlier decision, citing a USB authentication token as a prior art, although Trek’s lawyers mentioned the patents granted in other jurisdictions, where a similar USB authentication token was cited as being irrelevant. (The same patent feature was upheld by the Singapore High Court and the patent office in Taiwan.)

That same year, Trek applied for US registration of its ThumbDrive trademark on the principal register of the US Patent and Trademark Office. However, its application was rejected as the office considered the name “generic”. As Trek did not want the ThumbDrive trademark to end up in the same way as other unique and famous names that became generic and lost all their value (such as Aspirin, E-mail and Zipper), it appealed to the Trademark Trial and Appeal Board of the US. In 2010, the tribunal rejected the US Patent and Trademark Office’s earlier view that the trademark was generic, citing Trek’s long and extensive use of it, the company’s successful efforts in policing its incorrect use and the lack of evidence of competitors using it in a generic way. It ordered that Trek’s commercial rights be protected and the ThumbDrive trademark registered. The ruling recognised that Trek was the only manufacturer in the world that could sell the ubiquitous flash drives under the ThumbDrive brand.

In 2007, Trek and SanDisk Corporation, original inventor of flash storage cards, settled their copyright disputes through a cross-licensing agreement. It paved the way for settlement of all disputes between Trek and M-Systems, which was acquired by SanDisk in 2006.

In 2011, Trek filed a complaint with the International Trade Commission (ITC) against eight companies for infringing four ThumbDrive patents and asked the ITC to prohibit them from importing and selling such products in the US. ITC voted to institute investigation of all the companies. Out-of-court settlements and licensing agreements were subsequently concluded with two companies of the Verbatim Corporation that year. The second out-of-court settlement was completed with Patriot Memory in 2012. Some of the other defendants decided to exit the market altogether.

**Flucard**

A challenge with significant implication for the Flucard was posed by the fact that IP protection could be circumvented due to technical issues. For example, in 2011, some camera makers started to embed Flucard features in their cameras to emulate its functionalities and circumvent IP laws. This development became more rampant in 2013. Henn considered the situation to be the result of a shortcoming of IP laws and not an oversight of Trek.
**Making the products**

The manufacturing of Trek’s products to fulfil orders in hand or in anticipation of future demand supported its sales and marketing functions. In turn, its production people depended on suppliers for availability of essential components to make the products.

In 2004, Trek faced an acute global shortage and volatile price fluctuation of the NAND flash memory for making its ThumbDrive products. In response, it negotiated with strategic vendors for long-term supply of key components for its digital technology solutions, including the ThumbDrive. In 2006, it committed itself to buying 50 per cent to 60 per cent of its requirements for multi-level cell NAND flash memory from Toshiba for the next five years.

**Developing the market**

Legal protection of its IP had underpinned market development for Trek’s innovative products, in spite of its limitations. The company’s business as a whole was affected by the weakening consumer demand due to the global economic recession and financial crisis in 2008 and 2009. However, Trek was able to weather the storm.

Among the challenges Trek faced in the growing China market was the keen competition from traders who imported its products through Hong Kong and then sold them at lower prices than those shipped there directly by Trek. Many ThumbDrive and Flucard clones were also being made there. To compete and increase its market share in China in the long term, Trek reduced its profit margins to increase its sales volumes.

**ThumbDrive**

Trek’s mistake in sharing its ThumbDrive technology with potential partners while waiting for its patent application to be approved had resulted in many similar products flooding the market soon after the ThumbDrive was launched. The clones, mainly from China and Taiwan, ate into Trek’s market share, which was 100 per cent when it created the ThumbDrive. As soon as patents were granted, Trek took immediate legal action to stop companies from continuing to infringe its patents wherever possible.

Trek had learnt that such legal actions were necessary to continue to protect its IP, although the damages awarded and out-of-court settlements might bring it only limited financial benefits.

**Flucard**

Following the Flucard launch in 2010, at least four similar products emerged. To distinguish the Flucard from its competitors, Trek has developed mobile phone applications for it.

**Concluding remarks**

Apart from the usual start-up challenges, Trek had also faced problems in new product development, IP protection, production and market development. Under Henn’s strong and capable leadership, the company was able to overcome most of the problems and challenges. However, a few of them remained and had been on Henn’s mind. Three in particular stood out. In new product development, some essential components were not readily available, as the Kiss Drive example had
shown. In IP protection, Trek was unable to put up a substantive case against camera manufacturers for infringing its Flucard copyright based on existing IP laws. It did not have the financial resources to fend off simultaneous legal challenges in many jurisdictions by a large technology company that was determined to commercialise its IP without paying for their licensing fees.

Trek continuously reinvented itself to stay at the forefront of the global technology business. Its biggest challenge was to remain relevant and successful in the increasingly complex and competitive technology industry in future. To achieve that objective, it needed to research and develop more new innovative products, expand and protect its library of patents, and grow its business strategically. It focused on three key innovation pillars to improve people’s lives through its innovations – wearable, medical and cloud technologies. How relevant and how successful Trek would be depended very much on Henn’s leadership as its Chairman, CEO, entrepreneur, inventor and “cheer leader”.

According to Henn, the best way to ensure Trek’s future was to help create it. He himself exemplified this simple but profound truth in life. He had created his own company to ensure that he had life-long employment. He and his team had been creating new technology products that were changing people’s ways of doing things for a better life.

In leading his company as a sustainable business into the future, Henn no longer had to worry about retiring from his work when he still had the enterprise and energy to help make the world a better place for people to live, work and interact through Trek’s innovations.
End-of-Case Questions

**Question 1**
What do you think were Henn Tan’s technopreneurial qualities that had helped to drive his company Trek 2000 International forward since 1995? Cite relevant evidence from the case, where applicable, for your answer.

**Question 2**
What do you think are the possible ways to grow Trek’s business internationally in future, considering the rapid advancement in technology, growing market sophistication and increasingly competitive environment?

**Question 3**
How can a technology company like Trek continue to be relevant and successful in the increasingly complex and competitive technology business in future? State the underlying facts or assumptions for your answer.
Appendix A
Trek 2000 International’s Product Development Process

Source: Trek 2000 International
Appendix B
Trek 2000 International – Business Segments

Interactive Consumer Solutions

- Portable storage devices
  - ThumbDrive (USB flash drive in various capacities)
    - ThumbDrive Camera
    - ThumbDrive Chez (with enhanced security features)
    - ThumbDrive Compression (for data compression)
    - ThumbDrive Crypto
    - ThumbDrive Guard (with built-in anti-virus and anti-adware programme)
    - ThumbDrive Hardware AES (Advanced Encryption Standard)
    - ThumbDrive Hippo
    - ThumbDrive Micro
    - ThumbDrive Mini (with advanced encryption standard)
    - ThumbDrive Piccolo (with 32MB to 256MB storage capacities)
    - ThumbDrive Pro (with 8 GB memory)
    - ThumbDrive Portable Operating System (another world’s first)
    - ThumbDrive Sake (Storage, Anti-Piracy, Key and Protection, with three levels of authentication – biometrics, PIN and secured key management)
    - ThumbDrive Sake Mobile (security software suite for storing, transferring and protecting data)
    - ThumbDrive Sake Enterprise (for data access and control, and identity management)
    - ThumbDrive SIM (embedded with VoIP software and SIM card)
    - ThumbDrive Smart (with self-contained USB interface)
    - ThumbDrive Smartband (with USB drive and fitness applications)
    - ThumbDrive Strikes (Secure Transaction, Identity, Key, Encryption & Storage)
    - ThumbDrive Swan
    - ThumbDrive Swipe (biometric protection with built-in fingerprint-recognition facility)
    - ThumbDrive Swipe Armour (first in the world to incorporate CMS into an external USB device)
    - ThumbDrive Switchblade (one of the world’s fastest USB 2.0 external storage devices with transfer speed of 14 Mbps)
    - ThumbDrive Touch (biometric ThumbDrive)
    - ThumbDrive UDP
• Flucard (secure digital card with Wi-Fi capability used as a storage device in high-end digital cameras with SD slot and for sending photos and videos wirelessly to other cameras, smartphones, laptop and tablet computers, interactive whiteboards and cloud storage devices
  ▪ Flucard Pro
  ▪ Flucard Ultra
  ▪ Flucard for Pentax cameras – offers wireless LAN connection to compatible smartphones

• Wireless solutions
  o Ai-Ball (world’s smallest portable wireless video camera with computer, tablet and smartphone applications)
  o Wireless magnifying camera (video recording with computer, tablet and smartphone)
  o Wearable patient alert system (built-in Bluetooth and sensor capabilities to alert medical staff via smartphone and computer)

• Anti-piracy software
• Power management systems
• Security/encryption software
  o CHEZ Solution – prevents access to all unauthorised mobile storage devices
  o Two versions – Chez ThumbDrive Mini (with password protection) and Chez ThumbDrive Swipe (with biometrics protection)

• Enterprise solutions
• Consumer SSD (solid-state drive)
• EMMC (embedded multimedia controller)
• EMCP (embedded multimedia chip)
• Chipsets for Flucard, Ai-Ball, ThumbDrive, wireless products

Customised Solutions
• Firmware
• Modules
• Total solutions
• Software
• Portable storage
• Power management
• Microcontroller
• Medical

Licensing
Over 600 patents for portable storage devices, anti-piracy, power management, wireless and encryption solutions

Source: Trek 2000 International
Appendix C

Product Factsheet – Flucard

Description
Flucard® is an intelligent, wireless SD card that transforms your digital cameras, camcorders and other electronic devices with SD host slots into a wireless device. Simply insert the Flucard® into your devices and experience a whole new way in capturing, storing and sharing your precious moments.

Being the world’s first wireless-enabled, unique and simplistic card, no software installation is required. Just simply “insert-and-play” it on your device. One of the key technological features in the Flucard® is that it allows the user to select different functions within the Flucard®. It enables the Flucard® to operate with ease across all SDIOs, SD cards host interface devices and across most brands of cameras.

Features
The features in the Flucard® include:
• Insert and Play
No software installation is required. Pop a Flucard® into most brands of cameras and have instant access to its features.
• P2P Sharing
Wirelessly share photos and videos among Digital Still Cameras (P2P) and other Flucard®-enabled devices (camcorder, digital photo frame, etc.).
• Sharing On-the-Go
Review/Setting mode, select and download the pictures onto your laptop, tablet and smartphone wirelessly while on-the-go.
• Server Upload
Upload your photos wirelessly to the Flucard® portal and/or a server of your choice to free memory space and continue snapping. You can then access them anywhere in the world with a web-surfing device.
• Mobile Apps
Enhance and expand your Flucard® experience with our latest apps for the iPhone, iPad and Android platforms through authorised stores.
• Firmware Upgrades
Always stay up-to-date through our formidable and scalable Flucard® website (www.flu-card.com) with continuous free upgrades for your Flucard® firmware.

Flucard Portal
Users of the Flucard® will have immediate access to the portal through our Flucard® website (www.flucard.com) using the preset password that comes with the Flucard® packaging. With this access, users can begin to upload digital images to their personal accounts in the server and thereafter reorganise them into various albums according to their preference. This user-friendly portal also allows users to share their photos via email, Facebook, Picasa and Flickr.

Source: Trek 2000 International
Appendix D

Product Factsheet – Ai-Ball

Description
Ai-Ball is the world’s smallest portable Wi-Fi remote camera that allows you to stream and record videos wirelessly via laptop or smartphone while on-the-go.

Features
The features of the Ai-Ball include:

• Wireless
With its 802.11 b/g Wi-Fi interface, the Ai-Ball allows you to stream and record audio/video images through your mobile devices such as your smartphones (iPhones or Android devices) and laptops on-the-go.

• Ultra Portable
Powered by a CR2 battery and coupled with its compact design (30 mm in diameter and 35 mm in length and weighing just 100 gm with battery), you can easily carry the Ai-Ball around or hang it as a keychain.

• Long-Distance Recording
Stream or record your videos from a remote location even when you are far away from your Ai-Ball (e.g. overseas) using its Infrastructure WAN mode. It also supports Skype video-conferencing.

• Round-the-clock Recording
With the USB-powered Ai-Ball Cradle (sold separately), you can view or record audio/video images round-the-clock. Never miss another precious moment again.

• Firmware Upgrades
Always stay up-to-date through our Ai-Ball website (www.ai-ball.com) with continuous free upgrades for your Ai-Ball firmware.

Source: Trek 2000 International
Appendix E

Flucard Applications in Internet of Things

Source: Trek 2000 International
Bibliography


**About Nanyang Technopreneurship Case Centre**

With funding from both the National Research Foundation of Singapore and Nanyang Technological University, the Nanyang Technopreneurship Case Centre (NTCC) was one of the initiatives of the Nanyang Technopreneurship Centre (NTC) to enhance the quality of entrepreneurship education through the case pedagogy. These are part of NTC’s efforts to foster, promote and nurture enterprising mind-sets, skills and knowledge in entrepreneurship education.

There is a plethora of business cases but a general paucity of cases highlighting the specific problems faced by technopreneurs in growing their ventures. NTCC adds value to Technopreneurship education by developing a pool of cases on technology-based local and international enterprises. Through the cases, NTCC hopes to share the experiences, success stories and challenges faced by entrepreneurs/intrapreneurs in growing their organisations and how they overcome their problems to sustain growth.

The theme of this first compendium is “innovation through technology”. It features Singapore-based and global companies confronting issues and challenges due to technological shifts in the industry and changing market and competitive dynamics; when introducing new products in the marketplace; and in using technology to drive organizational change.

Online versions of these cases are available for complimentary downloads at [www.ntc.ntu.edu.sg/ntcc](http://www.ntc.ntu.edu.sg/ntcc).

Teaching notes are also available to faculty members for use as reference, reading and/or teaching materials in various academic and professional programs. For further information, please contact Ms. Denise Lee ([deniseleecw@ntu.edu.sg](mailto:deniseleecw@ntu.edu.sg)) and Mr. Wu Chong Chuan ([wucc@ntu.edu.sg](mailto:wucc@ntu.edu.sg)).

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