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Chartered Accountant SINGAPORE

Singapore CA Qualification Examination

INTEGRATIVE BUSINESS SOLUTIONS

ADVANCE INFORMATION

5 December 2022

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WARNING

Candidates **must not under any circumstances** contact any similar company or its agents to obtain research data, and they must use **ONLY PUBLICLY AVAILABLE INFORMATION.** Under no circumstances should they seek to use unpublished or private information.

ISCA INSTITUTE OF SINGAPORE CHARTERED ACCOUNTANTS

SINGAPORE ACCOUNTANCY COMMISSION

Dear Candidate,

This information package contains the **Advance Information** for the Integrative Business Solutions (IB) module final examination to be held on **5 December 2022.** A checklist of the documents (Exhibits) contained in this information package is provided on the following page. It is your responsibility to ensure that you have received every document listed.

Your task now is to familiarise yourself with this information including analysing the data provided. In addition, you are encouraged to undertake further research to form a holistic picture of the industry and markets in which the case study company is operating, and the general economic and business environment. Diligent preparation is essential for success in the IB Examination. **Guidance on preparing for the IB Examination is covered in your IB Toolkit.**

The IB examination will be conducted using Cirrus. Please download this Advance Information to the hard drive on your laptop and print this Advance Information prior to the examination day. Although you will have full access to the hard drive on your laptop during the examination, you are strongly advised to have your notes and other preparatory workings in **hard copy format,** as well as a standalone calculator that complies with the SAC's regulations for your examination.

You will also receive additional information (**Examination Day Documents**) on the case study company on the day of the IB Examination. The Examination Requirements will be included within Cirrus. Follow the instructions in Cirrus to download the Examination Day Documents. You are not allowed to print the Examination Day Documents on the day of examination. The Examination Day Documents complete the case study scenario and set out the requirements for the report that you are required to write. The IB Examination will be an open-book examination of **4 hours 30 minutes** duration. Your formal report will cover four specified areas, one of which will be to write an Executive Summary. Please note that **only your report commentary (including the assumptions made), appendices, and workings entered in Cirrus on the day of the examination will be marked**.

Encom

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Note: Unless otherwise stated, all dollar amounts ($) are in Singapore dollars.

EXHIBIT 1

The data centre industry globally and in Singapore

BACKGROUND

The term “data centre” was first used to refer to the room or department within an organisation where the information systems were housed. The data centre would include the servers or mainframe computers on which the organisation’s information systems ran. The growth of the internet, cloud computing and e-commerce has led to many businesses outsourcing some or all of their information systems needs to third parties. Services, such as web hosting, hosting of e-commerce systems, and cloud based services mean that many organisations’ systems are run by third parties and accessed via the internet. Providers of these services, plus social media giants require huge data centres, and many have set up their own hyperscale enterprise centres.

As digital transformation continues to accelerate and expand in markets around the world, a data centre industry has developed that enables businesses of all sizes to outsource their data centre needs. In addition to the hyperscale enterprise centres, the industry also provides multi-tenant data centres (MTDC) whereby a datacentre will provide services to a number of clients. Services include system infrastructure and applications, connection services (enabling businesses to connect with their suppliers and customers more effectively over private networks), and retail colocation, whereby smaller businesses can house their privately owned servers and networking equipment in a data centre, or rent hardware from the owner of the centre.

Developments in technology have led to an exponential growth in the need for data centres. The growth of digital assets and digital currencies has led to demand for systems that can perform the complex processing needed to record ownership of such assets - for example the use of distributed ledger technology, using cryptographic methods of security such as blockchain. The increase in the Internet of Things (IoT) means that businesses are collecting huge amounts of data.

Another area of growth is closed systems for sharing information among members of a particular group, such as information between government agencies, or information between customers and suppliers.

Market analysis – overview

According to Arizton, the global data centre market was valued at USD 215.8 billion in 2021 and is estimated to reach USD 288.3 billion by 2027, growing at a Compound Annual Growth Rate (CAGR) of 4.95% during the forecast period. The United States is home to the majority of data centres, with 2,751 recorded as of January 2022. However, in recent years, the Asia-Pacific (APAC) region's data centre market has grown rapidly, fuelled by investments from Amazon Web Services (AWS), Microsoft, Alibaba, Tencent, and Facebook, as well as digitalisation drives by government agencies. According to Arizton, APAC had the most data centre expansion/development projects in 2021. Furthermore, the region's data centre market witnessed investments of USD 63.15 billion in 2021 and will witness investments of USD 94 billion by 2027, growing at a CAGR of 6.30% during 2022–27.

Singapore's data centre market

An economic powerhouse in the heart of APAC, Singapore is among the fastest-growing data hubs, with more than 70 data centres in operation in January 2022. Singapore alone supplies 60% of the Southeast Asia market and has low data centre vacancy rates of under 2%. Cushman & Wakefield's latest 2022 Data Centre Global Market Comparison report ranked Singapore as the top data centre market in APAC, which is projected to become the world's largest data centre region over the next decade. Singapore pulled ahead of Hong Kong, a close competitor in Asia. Globally, Singapore is placed second only to Silicon Valley.

A number of factors contribute to Singapore's leading position in APAC's growing data centre market. The city-state's network infrastructure is highly advanced, facilitating the reliable and rapid expansion of the digital sector. Singapore has 24 submarine cables, of which 15 are international. One of the most cloud-connected locations in the world, Singapore saw a further rise in demand for cloud-based solutions following the implementation of 5G in 2020. Singapore also enjoys the fastest fixed broadband connectivity globally and a high level of digital access.

Besides infrastructure, businesses benefit from a well-educated local labour force that has a significant proportion of knowledge workers, supporting the growth of the knowledge-intensive digital economy. Another draw is the city-state's longstanding reputation as a business-friendly environment. The flat corporate tax rate of 17% for both domestic and foreign entities is among the lowest in APAC. Singapore also garners consistently high global rankings for political and operational stability as well as for a favourable regulatory environment.

All in all, Singapore occupies a superior strategic and competitive position, and is seen as a dependable digital gateway to Asian markets for local and foreign businesses alike.

Value to Singapore

The digital economy makes up 7% of Singapore's GDP, which grew by 7.6% in 2021 to $533.35 billion (approximately USD 391 billion). Digital Realty, which has the second-largest global market share in the data centre industry, has invested around USD 1 billion to operate its three Singapore data centres.

Government policy

Public spending on ICT

The Singapore government has allocated significant resources to support research, procurement, and innovation in Information and Communications Technology ('ICT'). Increased demand for data and computing capacity due to pandemic-driven digital transformation and remote-working policies as well as the rising adoption of Artificial Intelligence (AI), big data analytics, and IoT have spurred public funding and initiatives.

In FY2020, the government spent $3.5 billion on ICT procurement, marking an increase of 30% compared to FY2019. The 2020 expenditure centred on developing tools used in Singapore's COVID-19 pandemic response, such as IoT-enabled monitoring and tracking in the health sector; devising digital services for businesses and consumers; leveraging cloud-based systems; modernising the government's ICT infrastructure; and applying data analytics and AI in the public sector. The government further raised ICT spending to $3.8 billion in FY2021 to continue accelerating digitalisation nationwide.

Energy

Chief among the resource-related concerns is the consumption of electricity by the data centre industry. Data centres require huge amounts of electricity to power servers, storage facilities, and cooling infrastructures. As of 2021, Singapore's data centres have a total capacity of 1,000 megawatts, accounting for an estimated 7% of the island's total electricity demand. This figure is projected to rise to 12% by 2030 if the number and capacity of data centres increases in line with growing demand (assuming that the moratorium (Exhibit 10) is lifted).

While Singapore has a total generation capacity of 13,350 megawatts, exceeding the peak average demand of 7,000 megawatts, a surge in consumption could potentially put excessive strain on the electricity grid. This spurs a need to future-proof the island nation's energy infrastructure to ensure availability and reliability.

Furthermore, the increase in energy demand presents the challenge of accelerating carbon emissions. 96% of Singapore's energy is derived from fossil fuels, primarily natural gas and other petroleum products. Despite taking up only 721 square kilometres, 0.0005% of the world's land, the island state contributes around 0.11% of global emissions. Singapore is exploring ways to boost its green energy use but its geography and space constraints present challenges to large-scale local renewable power generation.

Water

Water consumption by the data centre industry is another major issue. A significant portion of water use is linked to energy production, as water is needed to make steam, which then turns the turbines that generate electricity. Thus, the immense energy demand of the data centre industry also translates to high water consumption.

Data centres directly employ water in cooling as well. A data centre's processing power generates heat, requiring cooling mechanisms to ensure that equipment functions optimally and is not damaged. Traditional cooling methods typically involve using energy to cool water, which is then sprayed in air as it flows past servers or evaporated to draw heat away from the machines. Even a small 1 megawatt data centre that employs such types of cooling would use 26 million litres of water a year. Singapore

has a diversified water supply comprising local catchment water, imported water, NEWater (high-grade reclaimed water), and desalinated water, but with demand expected to almost double over the next 40 years, the security and sustainability of the country's water supply continues to be of concern.

Land

Space is a precious resource for the small island nation, which has relied on land reclamation to expand by almost a quarter of its original size since its independence in 1965. The government plans to increase in size by another 7–8% by 2030, although the global shortage and restricted supply of the requisite type of sand has prompted Singapore to turn to polders (tracts of lowland reclaimed from the sea by the construction of dikes) for reclamation since 2016. More broadly, the future of land reclamation—and the optimised use of existing land given the limits of reclamation—is a key consideration.

Singapore's data centres take up an estimated 4.5 million square feet. With the data centre industry exacerbating land scarcity, the Infocomm Media Development Authority (IMDA) partnered with Keppel Data Centres and Huawei International in 2017 to conduct a government-backed joint feasibility study for a high-rise green data centre building. While high-rise data centres do exist, achieving green credentials at the same time is a major technical challenge that has implications for cooling methods as well as power generation capabilities.

As such, a high-rise green data centre is not a panacea that is achievable in the near future, and other solutions for optimising space while fulfilling sustainability criteria vis-à-vis energy, water etc. are necessary for Singapore.

Regulators

Governments around the world are increasingly regulating the data centre industry. Security of data is an obvious concern, and the Singapore Personal Data Protection Act of 2012 was recently updated. In addition, there are regulations requiring compliance with standards relating to incident responses such as cloud outage, levels of security for different types of data, and environmental standards. These regulations can be onerous, particularly for companies operating data centres in different countries, each with their own set of regulations.

Outlook

Despite a two-year moratorium (Exhibit 10) and the anticipation of tighter requirements for data centre efficiency in Singapore, data centre and hosting investment expenditure is set to reach USD 2.1 billion in 2025 according to GlobalData. A separate report by Arizton predicts that Singapore's data centre market size will witness additional investments of USD 5 billion by 2026.

These projections are favourable for Singapore's data centre sector, but further development will need to focus on resource efficiency in line with the government's conditions for lifting the moratorium. This means additional planning and investment by operators in order to realise sustainability goals in the construction and operation of new facilities and potential overhauls of existing facilities as well. Given that operators in Singapore already contend with high costs of land, construction, and maintenance, the increased investment required for implementing sustainable methodologies and practices exerts added cost pressure. This could negatively affect Singapore's future competitiveness as a data centre hub compared to burgeoning markets elsewhere in Asia, although the country's current standing is unmatched due to various aforementioned factors.

Besides the challenge of sustainably scaling business to meet voracious demand, the data industry also faces regulatory pressure to comply with data security and privacy frameworks. Singapore passed major amendments to the Personal Data Protection Act (PDPA) in 2020, reflecting the global trend towards stricter data privacy and security legislation. Singapore data centres that fail to comply face not only hefty financial penalties but also reputational damage.

Significantly, many challenges demand technological and infrastructural innovation. Meeting growing data and computing demands while bolstering security and sustainability requires upgrades to servers and other hardware as well as infrastructural improvements for data centres as well as the municipalities in which they operate. This especially pertains to issues of renewable energy and water supply, as data centres are heavily reliant on public utilities. As such, sustained public spending as well as public-private partnerships with a view to leveraging innovation

and furthering research and development in relevant areas are paramount for the health of Singapore's data centre industry.

END OF EXHIBIT 1

EXHIBIT 2

Encom: Company background, markets and governance

Overview

Founded in Singapore, in 2000, Encom is a global provider of carrier- and cloud-neutral data centre, colocation, and interconnectivity solutions.

Being ‘carrier neutral’ means Encom is independent from any one internet service provider, so provides services irrespective of the customer’s provider.

‘Cloud neutral’ means a customer is not prevented from using other cloud service providers just because they use some cloud services provided by Encom.

‘Colocation services’ is a rental service offered to customers to store their servers and other hardware necessary for daily operations. The service offers shared, secure spaces in cool, monitored environments ideal for servers, while ensuring bandwidth needs are met.

‘Interconnectivity solutions’ link data centres together, both within Encom and between Encom and other data centre providers, including customer-owned centres.

It also has significant operations globally. Headquartered in the Ayer Rajah district in Singapore, the company employs approximately 1,700 people worldwide and owns 41 data centres in 25 countries across North and South America, Europe, APAC, Africa, and the Middle East. Encom’s Asia footprint includes two facilities in Singapore, one in Hong Kong, one in Seoul, one in Osaka, and one in Tokyo. Three new facilities—in Hyderabad, Auckland, and Muscat—are in the pipeline and will be completed during the year ended 31 October 2022.

Encom is listed on the Singapore Exchange (SGX). The company priced its initial public offering at $12 per share in August 2004, raising $250 million.

Key solutions/services and revenue streams

Colocation

70% of Encom's recurring revenues stem from colocation services. Encom offers a range of secure, scalable, and move-in ready cages, cabinets, and suites.

Data centre services

Encom provides specialised turnkey infrastructure services, encompassing design and planning, sourcing (e.g. cages, cabinets, power distribution systems, cable management equipment, security systems etc.), and installation. Encom also offers custom-built data centres and fit-out ready sites.

Encom's data centre management services include the EncomOpticon, an online data centre monitoring software platform that delivers real-time operations and environmental data, including accurate temperature and humidity readings as well as insights on power draw and mechanical and electrical performance of components. Encom also provides on-demand operational assistance via EncomHands, who support customers' in-house technical teams with both remote and on-site management and troubleshooting tasks.

Encom uses proprietary AI algorithms to manage its data centre networks – redistributing processing loads where necessary, and monitoring networks for developing cybersecurity threats with intelligent immediate response capability. Following requests from clients, Encom is considering packaging these AI assets into a service to help clients manage their own networks.

Interconnection

Encom's interconnection services, encompassing hardwired and virtual data centre connectivity, account for 18% of revenues. Encom offers cross connects within facilities, campus and metro connectivity, internet exchange, service exchange, and IP bandwidth.

Cloud and hybrid solutions

Encom provides scalable multi-cloud access and hybrid-cloud deployments. (A hybrid cloud is one in which applications are running in a combination of different environments) Cloud and hybrid-cloud services accounts for 12% of Encom's recurring revenues and this proportion is expected to grow.

Approximately 80% of Encom's revenue is recurring. Clients typically enter into three year fixed price contracts and pay monthly. The remaining portion of Encom's revenue is from additional services such as setting up infrastructure.

Key segments

Encom primarily serves the financial and healthcare segments, which have undertaken rapid digitalisation. This trend was further spurred by the COVID-19 pandemic. Cloud and network service providers (ie businesses that own and operate the internet 'backbone') also make up a significant portion of Encom's customers. The company also aims for steady growth in the digital media and retail segments. As a DGX-Ready (DGX are NVIDIA servers that specialise in AI and machine learning) colocation provider, Encom supports the demands of AI, which will continue to be a key focus for the company due to the growing adoption of AI in the financial and healthcare segments, as well as in entertainment and retail.

Competitors

Encom's primary competitors are among the biggest data centre firms globally, and all have at least one site in Singapore.

Singagiga, Inc.

Founded in 1998 and headquartered in Redwood City, California, Singagiga is a leader in the digital infrastructure industry, with extensive data centre, colocation, and interconnection services. Singagiga employs more than 10,000 people and has a footprint spanning 27 countries, with over 235 data centres in 65 markets. It is the largest global colocation provider, with 11.1% market share. Singagiga Singapore, which comprises 5 data centres, is the most network-dense provider in Southeast Asia. The company went public in 2000 on the NASDAQ stock exchange, based in New

York. In 2021, Singagiga recorded USD 6.636 billion in global revenues, marking an 11% increase over the previous year.

Digital Realty Trust

Digital Realty Trust (NYSE: DLR) was established in 2004 by the private equity firm GI Partners L.P. It is one of two publicly traded data centre businesses in the United States, the other being Singagiga. Digital Realty has more than 285 data centres in 26 countries, and 8% market share in global colocation services. It has 3 data centres in Singapore and plans to raise USD 600 million from the IPO of the standalone Digital Core business, which was successfully listed on the Singapore Exchange in December 2021. Digital Realty reported USD 4.428 billion in global revenues in 2021, marking a 13.43% increase over the previous year. It employs 2,878 people.

China Telecom Corp. Ltd.

Founded in 2002 and headquartered in Beijing, China Telecom is a red chip company of the state-owned China Telecommunications Corporation. One of the largest global telecommunications providers, China Telecom employs 281,192 people and has more than 450 data centres in mainland China, its primary market, as well as facilities and services in the Americas, Europe, Australia, Africa, and Asia. It has 6.1% market share in global colocation services. Total revenues posted in 2021 amount to RMB 842.38 billion (USD 132.36 billion), although this figure includes all of the activities of China Telecom, which is a full service telecom provider. China Telecom's H shares have been traded on the Stock Exchange of Hong Kong since 2002, while A shares are listed on the Shanghai Stock Exchange, where the company raised USD 7.3 billion in its 2021 debut. China Telecom's US operations are less stable: in 2021, the company was delisted from the New York Stock Exchange by US presidential executive order and had its operating license revoked by the Federal Communications Commission (FCC). The FCC designated China Telecom's American subsidiary a national security threat in 2022.

Funding

Private equity accounted for 80% of all data centre acquisitions that occurred in 2019. A CBRE survey of large institutional investors found that nearly 95% plan to increase

their capital deployment in the data centre sector in 2022, with over 75% aiming to allocate more than USD 100 million of equity.

Private equity is an important source of funding for Encom's ongoing expansion, in line with industry-wide trends.

Costs

From an operational standpoint, Encom incurs high costs for electricity, water, and land. The construction of new sites is another significant cost, broken down into labour, building materials such as steel, and components such as chips, PDUs, ATS units, and generators.

Encom also incurs costs in security and risk management, encompassing the protection of digital assets against cyberthreats as well as the protection of physical assets against flooding, storms, wildfires, and other natural disasters. Singapore has fairly low risk of natural disasters but preparedness is necessary due to climate change. Given the importance of maintaining top-level security, insurance necessarily factors into Encom's costs.

Expenditure on research and development and technological modernisation has increased in recent years owing to the necessity of upgrading infrastructure and equipment to meet the advanced performance demands of AI and sustainability targets. Encom is also spending on implementing renewable energy sources in its operations.

Finally, labour costs have continued to soar due to a shortage in tech professionals, both in Singapore and globally.

Challenges & future direction

Skyrocketing demand for data centres, cloud services, and computing power capable of supporting AI spells further robust growth for Encom and the data centre industry at large. However, the success of Encom's ongoing expansion rests on its ability to weather the following challenges and capitalise on emerging opportunities.

Sustainable resource use

In terms of land use, expanding Encom's physical footprint is an inevitable consequence of the aggressive demand for data and computing. The company views resource efficiency and sustainability as the priority, i.e. ensuring that performance is optimised within a well-designed space. This approach extends to site selection, with factors such as proximity to energy plants and water availability playing a part in decision-making.

A pressing resource issue is increased power demand, especially with the adoption of high power density equipment for AI-enabled applications and cryptocurrency mining. This generates more heat, which necessitates cooling methods that in turn use more energy as well as water. In Singapore, this is exacerbated by the hot and humid tropical climate. Encom Singapore must therefore ensure that its data centres are capable of handling the increased data load and computing demands while simultaneously maximising energy efficiency, adopting sufficient and effective cooling techniques, and optimising overall consumption of electricity and water. This must be done in order to meet the sustainability criteria set by Encom as part of its environmental, social and governance (ESG) commitments as well as by the Singapore government.

Renewable energy sources are a key solution for meeting intensified power demand in a green way, but they pose yet another challenge for Singapore, whose renewable energy production is constrained by geography, such as space limitations. A floating solar farm and imports of green electricity from Malaysia are among the avenues being explored by the government.

In the short term, public subsidies such as the Singapore National Environment Agency's Energy Efficiency Fund support Encom in bearing the costs of adopting advanced equipment and mechanical systems to optimise consumption. Resource efficiency is also improved by automated infrastructure management platforms. Encom's development strategy already takes sustainability as the default, but the company can expect to incur additional costs as it keeps pace with technological advancements that enhance efficiency.

Noting the potential of public/private partnerships (PPP) in Singapore, such as the $23 million Sustainable Tropical Data Centre Testbed backed by the government and

Meta, Encom plans to bolster its strategic collaborations with public agencies, national research institutions, and other industry players to find solutions. Encom is also leveraging the IMDA's Green Data Centre Innovation Programme to accelerate its development and implementation of efficiency-maximising technologies and methodologies.

Supply chain disruptions

The data centre industry has not been as immediately and adversely affected by pandemic-related supply chain disruptions as, say, technology manufacturing. However, ongoing shortages of chips and raw materials could result in future delays that interfere with Encom's ability to complete its expansion projects and to meet commitments to customers.

Geopolitical instability has introduced significant additional risk to supply chains. Notably, the Russia-Ukraine war could result in protracted disruptions to the supply of steel, palladium, platinum, and nickel, and sanctions against Russia are a barrier to trade.

Changes in demand

The global political environment could lead to changes in economic activity. A long period of globalization, in which countries traded more seamlessly with each other is being replaced by a more protectionist world in which countries such as the US are increasing tariffs, and the UK has exited from the European Union. There has been a change in the world order with countries such as the BRIC (Brazil, Russia, India and China) have become more dominant in terms of international trade. This may lead to a change in which countries experience economic growth in future, which will determine the demand for data centre services.

Security and disaster preparedness

Data breaches and failure to maintain 99.999% uptime could cause devastating reputational damage. Minimising security threats and remaining operational even during adverse events are thus paramount.

One arm of Encom's strategy is to leverage innovation internally, ensuring that routers, switches, firewalls, storage systems, servers, and application delivery controllers etc.

are best-in-class to facilitate secure network and storage infrastructures. AI is an important functionality for operations management, helping to detect risks ahead of time and to automatically engage fail-safes where possible.

The company notes that current disaster recovery sites and insurance may not be sufficient for counteracting risks. Mission-critical systems typically require hot sites with high availability architectures and minimal Recovery Point Objectives and Recovery Time Objectives. Running more hot sites would incur significant costs, however, and add to resource consumption.

Security policy and compliance

Encom has protocols in place for the assessment, response, and reporting of threats or breaches to ensure compliance with security standards set in legislation including Singapore's PDPA, and where relevant for its overseas operations, Europe's General Data Protection Regulation, and the California Consumer Privacy Act. Failure to comply could result in hefty financial penalties as well as reputational damage.

At the same time, recognising that security—and compliance with stringent data security and privacy policies—is an urgent need across all industries, Encom is capitalising on global regulatory pressure by developing an intelligent cloud-based data management tool to help business customers track, classify, and manage their data lifecycles. While Encom's portfolio of enterprise solutions already features data management and security, this new tool will expressly focus on streamlining compliance.

Governance

The company is governed by the board of directors which mainly comprises non-executive directors:

Cheng Tan	CEO	Cheng moved from a local competitor in 2014. He has an MBA from the National Institute of Technology, specialising in IT business management. He owns 1% of the ordinary share capital of Encom.
Sarah Quek	Non-executive chair	Sarah is an IT Consultant by background, and has occupied several senior management positions in the technology industry. She joined the board as the Chair in 2018.
Jayne Horowitz	Non-executive director	Jayne is a retired solicitor. She specialised in intellectual property law. In addition to her role as a non-executive director, she also advises the sales and marketing function in relation to client contracts.
Wei Chong	Non-executive director	Wei is a retired banker. He leads the Audit committee of Encom, working with Jayne Horowitz and Hongkai Yip.
Amoleka Chai	Non-executive director	Amoleka heads the remuneration committee along with Sarah Quek and Kim Liang. Amoleka is a retired executive recruitment specialist, and joined the board in 2019. She has 2 other non-executive positions – one in education, and another in a manufacturing business. Amoleka also leads the nominations committee, working with Wei Chong and Hongkai Yip.
Hongkai Yip	Non-executive director	Hongkai is a retired IT consultant, and joined the board in 2017.
Kim Liang	Non-executive director	Kim represents DC Investment Capital, a private equity investor who owns 25% of the ordinary shares of Encom. She joined the board in 2021.

Day to day management of Encom is vested in the executive committee. With the exception of Cheng Tan, the other members of the executive committee are not members of the board of directors.

The members of the executive committee are as follows:

Cheng Tan	CEO	See above
Nicole Lau	Finance Director	Nicole is a professional accountant with 10 years post qualification experience. Nicole was the finance director of a start-up gaming firm until 4 years ago, when she moved to Encom as financial controller, being promoted to the executive committee two years later.
Rajeev Singh	Human Resources Director	Rajeev started his own recruitment consultancy in the IT sector, before selling to competitors 8 years ago. He completed his IHRP qualification before starting as HR director at Encom in 2017.
Valerie Huang	IT and Operations Director	Valerie started as a school leaver with Encom 20 years ago, and worked her way up from Operations. She was instrumental in Encom's operational expansion into the US and Europe, and was promoted to the executive committee in 2016.
Jan Petersen	Sales and Marketing Director	Jan has a background in sales for multinational facilities management businesses. He moved to Encom in 2014 as a senior sales manager, and is a member of the Singapore Institute of Marketing. He was promoted to the executive committee in 2019.
Lim Chan	Product Development Director	Lim has a background in network management and has a particular interest in AI.

END OF EXHIBIT 2

EXHIBIT 3

Encom: Management accounts for the years ended 31 October 2021 and 31 October 2020

Statement of Profit and Loss

	Year ended 31 October	
	2021	**2020**
	$000	*$000*
Revenue		
Colocation	789,176	724,030
Interconnection	197,455	173,954
Cloud and hybrid services	135,305	57,349
Total revenue	**1,121,936**	**955,333**
Cost of sales:		
Data centre staff salaries	(61,431)	(53,900)
Depreciation	(214,204)	(196,288)
Amortisation of intangibles	(34,932)	(33,838)
Rental payments	(101,489)	(97,211)
Energy and water costs	(136,000)	(120,027)
Repairs and maintenance	(9,822)	(9,527)
Total cost of sales	**(557,878)**	**(510,791)**
Gross profit	**564,058**	**444,542**
Sales and marketing	(126,009)	(122,121)
General and administrative	(221,305)	(185,467)
Profit before interest and tax	**216,744**	**136,954**
Interest cost	(24,000)	(24,000)
Profit before tax	**192,744**	**112,954**
Tax expense	(32,766)	(19,202)
Profit after tax	**159,978**	**93,752**
Dividends	(39,995)	(23,438)
Retained profit	**119,983**	**70,314**

Statement of financial position	Notes	At 31 October 2021	2020
		$000	*$000*
Non-current assets			
Property plant and equipment	1	1,656,356	1,585,685
Intangible assets	2	208,849	155,299
Total non-current assets		**1,865,205**	**1,740,984**
Current assets			
Accounts receivable		115,908	115,045
Cash and cash equivalents		247,791	247,065
Total current assets		363,699	362,110
Total assets		**2,228,904**	**2,103,094**
Equity			
Share capital		400,000	400,000
Retained profits		1,279,450	1,159,467
Total equity		**1,679,450**	**1,559,467**
Long term liabilities			
Long term loans		400,000	400,000
Current liabilities			
Accounts payable		149,454	143,627
Total equity and liabilities		**2,228,904**	**2,103,094**

Notes to the management accounts:

1. Property, plant and equipment

	At 31 October	
	2021	**2020**
	$000	*$000*
Land and buildings	1,146,092	975,207
Leasehold improvements	343,845	330,929
Core systems	1,405,638	1,237,184
Construction in progress	164,486	231,866
Total cost	**3,060,061**	**2,775,186**
Less: accumulated depreciation	(1,403,705)	(1,189,501)
Net book value	**1,656,356**	**1,585,685**

2. Intangible assets

	At 31 October	
	2021	**2020**
	$000	*$000*
Capitalised internal use software	277,757	189,275
Licenses	4,849	4,849
Less: accumulated amortisation	(73,757)	(38,825)
Total	**208,849**	**155,299**

3. Non- financial information

	At 31 October	
	2021	**2020**
Average number of clients	1,700	1,690
Number of data centres at end of year	41	41
Average number of employees		
Engineering and Operations	798	686
Sales and marketing	315	310
Management finance and administration	735	732
Total	**1,848**	**1,728**

END OF EXHIBIT 3

EXHIBIT 4

Encom: Draft ESG report for the year ended 31 October 2022

The following draft report has been prepared by a committee made up of the Finance Director, IT and operations director and human resources director for the board of directors to consider. The report has not been published yet.

Introduction

Encom's ESG commitments create long-term value for the company, its shareholders, and the communities in which Encom operates.

Environment

Sustainability is a priority for Encom, which is proud to meet green targets for its data centre construction and operations worldwide. Encom also purchases renewable energy wherever it can and continues to optimise energy efficiency throughout its corporate offices and data centres.

Our data centres use large amounts of energy, and we recognise that the production of electricity using non-renewable resources leads to an increase in greenhouse gasses. We monitor the amount of energy that we use and the portion of our energy that comes from renewable sources. Information for the last two years is as follows:

Metric	Units	2022	2021	Change (2022 v 2021)
Energy consumption	Gwh	1,348	1,214	11% increase
% Renewable energy	%	72%	70%	2% increase
Carbon emissions scope 1	Metric tonnes of CO2 equivalent	10,800	11,020	2% reduction
Carbon emissions scope 2	Metric tonnes of CO2 equivalent	415,800	456,040	8.8% reduction

Notes:

1. Scope 1 carbon emissions refers to the greenhouse emissions that Encom makes directly in its data centres (e.g. by burning fuel to heat the offices).
2. Scope 2 carbon emissions refers to carbon emissions that Encom makes indirectly (e.g. the use of electricity by Encom leads to energy companies creating carbon emissions.)

Water usage

Encom recycles water used for cooling wherever possible For water which is unable to recycle is sourced from desalinated seawater or NEWater supplies.

Water consumption by data centre operations in 2022 was a total of 35,048 million litres of water – an equivalent of 26,000 litres per megawatt hour.

Water consumption in 2021 by data centre operations was 32,275 million litres of water – an equivalent of 26,586 litres per megawatt hour.

This reduction was achieved by the use of more energy efficient equipment that produces less heat.

Social

Encom's social commitments include diversity and inclusion practices within the organisation as well as external programmes such as training and scholarships centred on digital empowerment and talent development in communities. Encom also participates in fundraising and giving campaigns.

Employee statistics:

Employee gender ratio (male: female)	66: 34
Staff turnover rate	11%

Governance

Transparent and ethical governance is a key pillar of Encom. The company enforces strict standards to ensure compliance with tightening data security and privacy legislation in Singapore and globally. Encom also screens suppliers using detailed ESG criteria.

Encom follows the best practice as the board contains a majority of independent, non-executive directors. Also, the role of chairman and chief executive are held by separate individuals. The company complies in all material ways with the Code of Corporate Governance of Singapore.

The company aims to promote diversity, and the current board consists of four female members from a total of seven. The full board meets four times a year to monitor the performance of the company, set strategic objectives and give the independent non-executive directors the opportunity to review the executive directors' performance.

The executive committee meets weekly to discuss the operations and deal with any major issues that occur.

END OF EXHIBIT 4

EXHIBIT 5

Minutes of board meeting discussing the purchase of an existing data centre or building a new one in Singapore

Encom – Board meeting

Date: 10 September 2022

Present: Sarah Quek (Chair), Cheng Tan (CEO), Jayne Horowitz, Amoleka Chai, Hongkai Yip, Kim Liang

In attendance: Nicole Lau, Rajeev Singh, Valerie Huang, Jan Petersen, Lim Chan

Apologies: Wei Chong

Extract from board minutes starts….

Expansion to new sites

Valerie Huang opened the discussion by reminding the board that operations had been strained over the last couple of years for several reasons, all related to the Covid-19 pandemic:

- Increased homeworking in the economy had led to a sharp increase in video conferencing and working via VPN
- More leisure time had led to increased use of IT at home – for streaming mainly but also a noticeable heavy spike in cryptocurrency trading and NFT commerce
- Encom staff homeworking – it had taken time for operations to adjust to employees working from home, especially when disruptions occurred that require manual intervention on site.

Valerie was pleased to report that extensive operational planning had eased the third issue, and that homeworking was now likely to be a permanent feature of working life for Encom employees, not least to reduce the 'shock factor' in the event of future lock-downs. However, increased operational capacity was required to protect Encom against traffic spikes in future, and also to provide some spare capacity (or 'redundancy') in case of operational issues at other commissioned sites.

Valerie then briefed the board on the Singapore government's 'new site moratorium'. In short:

- No new sites were allowed to be built post 2019 in Singapore due to the heavy resource usage of data centres – this usage was seen as a threat to the government meeting its climate change related targets.
- However, from 2022 a limited number of new sites would be permitted going forward, probably restricted to about 2-3 a year up to 30 megawatts each, provided they comply with tight environmental specifications related to energy consumption and water usage. The limited number of sites and high specifications would make tendering a challenge. The alternative was to acquire an existing site with easier environmental specifications and requirements.

Nicole Lau suggested that the specifications for existing sites would surely be increased in time as well. Valerie agreed that would seem logical but could not confirm whether or not that would be the case. Jan Petersen wondered if Encom should pre-empt legislation and upgrade all sites sooner rather than later, to present a distinctly 'green' image to the market and attract customers – after all, clients have their own environmental targets to hit. Nicole wondered if that would be prohibitively expensive, but Jan pointed out they may not have any choice in the medium to long term anyway.

Jayne Horowitz suggested that buying an existing operation was likely to be lower risk than building a new site, as it was a proven operation. Valerie pointed out the rate of obsolescence of much of the equipment in an existing centre was very fast given the fast rate of technology improvements in the sector, and the exponentially growing demand. This meant buying an existing centre would require on-going investment in any case – if not immediately then soon. Valerie also questioned whether retrofitting some of the equipment to improve the environmental performance of an existing site could be difficult e.g., effective eco-friendly cooling would require significant changes to the design and layout of the whole site. It may be easier and cheaper to build a new site.

The board agreed further detailed investigation was required, and Nicole Lau agreed to work with Valerie to draft some assumptions for a more formal appraisal of the 2 options.

Potential sale of data

As you know, we run the systems for ChatBox, a social media platform which is popular with younger adults. We have been contacted by an advertising agency that advertises on ChatBox and wishes to have more information about the demographics of users of ChatBox. They have suggested that if we provide them with anonymised data, from which it would not be able to identify the individuals, we would not be in breach of data protection. They would be prepared to pay a considerable amount for this data. We have not discussed this with ChatBox themselves.

….Extract of board minutes ends

END OF EXHIBIT 5

EXHIBIT 6

Briefing paper from HR: Talent shortage in Singapore and short/ medium/ long term implications

Briefing paper

To: The board, Encom
From: Rajeev Singh, Human Resources Director
Subject: Talent shortage in the data centre sector
Date: 16 September 2022

Introduction

This briefing paper is to alert the board to a growing crisis in the data centre sector: Technology workers are in short supply. This potentially threatens our expansion plans, and increased 'poaching' of our key staff with the consequential risks of operational disruption to key parts of Encom's business.

Talent shortage

Competition for tech talent remains high due to the global shortage of software engineers, developers, and cybersecurity specialists, exacerbated by ramped-up digitalisation across sectors and the attendant expansion of tech businesses. Additionally, the tech sector requires professionals in content marketing, policy, and legal fields to support growth. To attract and retain staff, Encom offers generous salaries, increments, and sign-on bonuses, along with other benefits such as financial assistance, retirement plans, health and wellness services, and flexible working. However, competition for talent is fierce and is eroding our historically stronger compensation and benefits value proposition for employees.

Encom is also aware of the need to maintain an attractive corporate culture to engage and retain staff. Internally, Human Resources regularly surveys employees for a better understanding of their engagement levels and needs. Externally, Encom has bolstered public relations and outreach with a view to improving the company's image, for example by highlighting its commitments to innovation, ESG, and employee empowerment, as well as changing the perception of "996" work culture in tech.

The short term is probably manageable as staff satisfaction levels are currently very high, however in the medium to long term we could lose talented employees – they have the most and best options of where to go, and are being actively poached.

Suggested additional response

In my view, more needs to be done to attract, retain and develop talent. I would be interested in the Board's views on:

- A FastTrack programme for key employees, with more or less guaranteed promotions and accelerated training.
- Development funds to be made available to identified talent to allow them to try new ideas.
- Formal mentoring with executive committee members.
- A programme of networking events, creating a talent network within the business, and introducing them to key stakeholders.

I look forward to hearing the board's views.

Best wishes,

Rajeev Singh

HR Director

Encom

END OF EXHIBIT 6

Cyber security policy

Overview

This document outlines key provisions for cyber security in overview. Detailed policy documents are maintained separately to supplement the below and make them an operational reality. The operational documentation is the responsibility of the Information Technology (IT) and Operations function.

Governance

The IT and Operations Director has ultimate responsibility and accountability for all aspects of cyber security. This is in keeping with the technical nature of cybersecurity.

General

All personal data is subject to the requirements of the Singapore Personal Data Protection Act. Operational procedures ensure all major requirements are adhered to.

Encom globally maintains ISO 27001 compliance, and subjects itself to continuous independent verification through a combination of internal audit and external consultancy arrangements.

Detailed and extensive disaster recovery plans are in place and regularly tested.

Employee training: The IT and Operations department run induction programmes for all new employees and regular updates for all staff. This is supported by spot checks (such as simulated 'phishing' exercises, or the use of social engineering) to persuade employees to breach policies such as password sharing.

Software and Data

All employees are obliged to protect confidential data – this includes personal and client data, as well as Encom business data and information.

System procedures are in place for:

- Automatically updating firewall and antivirus software

- Continuous back-ups kept offsite, accessible via the cloud.
- Fully mirrored hot backup sites for every location, continuously tested for operational readiness.
- Network monitoring using proprietary AI tools – this detects unusual and/or malicious activity across the Encom network and instantaneously takes defensive action. This is administered globally to detect suspect patterns of behaviour across geographical territories.
- Password maintenance – the system enforces periodic password changes requiring non sequential passwords to include letters (including capitals), numbers, punctuation. The system automatically rejects easily guessable words or phrases. Password leaks are dangerous since they can compromise Encom's entire infrastructure. Not only should passwords be secure so they won't be easily hacked, but they should also remain secret. For this reason, we require our employees to remember passwords instead of writing them down.
- Forbidding software downloads – downloads can only be arranged through the IT and Operations function

Third party applications and functions are subject to stringent service level agreements, ensuring supply chain cyber security is at least as strong as Encom.

Client access is restricted to their own data, and is tightly controlled and monitored so as not to expose Encom to poor client cybersecurity practices.

Emails

Emails often host scams and malicious software (e.g. worms). To avoid virus infection or data theft, we instruct employees to:

- Avoid opening attachments and clicking on links when the content is not adequately explained (e.g. "watch this video, it's amazing.")
- Be suspicious of clickbait titles (e.g. offering prizes, advice.)
- Check email and names of people they received a message from to ensure they are legitimate.
- Look for inconsistencies or give-aways (e.g. grammar mistakes, capital letters, excessive number of exclamation marks.)

If an employee isn't sure that an email they received is safe, they should refer to the IT and Operations helpdesk.

Hardware

When employees use digital devices to access company emails or accounts, they introduce security risk to our data. Encom requires our employees to keep their company-issued computer, tablet and cell phone secure. They can do this if they:

- Keep all devices password protected.
- Ensure they do not leave their devices exposed or unattended.
- Log into company accounts and systems through secure and private networks only.

Employees may not take company-issued devices off site.

We also require our employees to avoid accessing internal systems and accounts from other people's devices or lending their own devices to others.

All personal phones, tablets, computers and digital storage devices must be checked in to security by on-site workers before entering the site. On-site workers expect that they will be subject to a personal search when entering and leaving the premises.

All ports are disabled on company hardware, with the exception of network connectivity and power. Exceptions can be made if a business case is made to and approved by the IT and Operations function.

Additional measures

To reduce the likelihood of security breaches, we also instruct our employees to:

- Turn off their screens and lock their devices when leaving their desks.
- Report stolen or damaged equipment as soon as possible to the IT and Operations helpdesk.
- Change all account passwords at once when a device is stolen.
- Report a perceived threat or possible security weakness in company systems.
- Avoid accessing suspicious websites.
- Comply with our social media and internet usage policy.

Remote employees

Remote employees must follow this policy's instructions too. Since they will be accessing our company's systems from a distance, they are obliged to follow all data encryption, protection standards and settings, and ensure their private network is secure.

We require them to ensure their home working environment is reviewed and approved by the IT and Operations helpdesk before homeworking can be allowed.

Disciplinary action

We expect all our employees to always follow this policy and those who cause security breaches may face disciplinary action:

- First-time, unintentional, small-scale security breach: We may issue a verbal warning and train the employee on security.
- Intentional, repeated or large scale breaches: We will invoke more severe disciplinary action up to and including termination.

We will examine each incident on a case-by-case basis.

Additionally, employees who are observed to disregard our security instructions will face progressive disciplinary measures even if their behaviour hasn't resulted in a security breach.

Take security seriously

Everyone, from our customers and partners to our employees and contractors, should feel that their data is safe. The only way to gain their trust is to proactively protect our systems and databases. We can all contribute to this by being vigilant and keeping cyber security top of mind.

END OF EXHIBIT 7

EXHIBIT 8

Risk register extract concerning Covid-19 impact and lifting the moratorium

The following is an extract of the risk register prepared by the risk management group, and monitored by the Audit Committee on behalf of the board as a whole:

Risk	Probability (H/M/L)	Impact (H/M/L)	Priority (1-10, 1 is high)	Response
Covid-19 : The pandemic caused extreme pressure in terms of demand for services, and impacted the efficiency and effectiveness of global operations. Increased homeworking dramatically increased data demand workloads, coupled with Encom staffing shortages due to illness, and operational problems with working from home in lock-down. Higher rates of sick and medical leave among staff, and the risk of aggressive variants continue to be a major concern.	H	H	1	Increase capacity to cope with sudden spikes. Increase the use of hot backup sites to cope with disruptions. More home working planned as standard going forwards.
Moratorium on new data centres in Singapore: The moratorium on new sites has restricted growth in Singapore. These restrictions are set to lift, which is likely to lead to a need to suddenly expand in Singapore subject to site availability. This will strain resources and human resources locally.	H	H	2	Seek to expand ahead of the moratorium lifting as much as possible, possibly by purchasing existing sites.

Risk	Probability (H/M/L)	Impact (H/M/L)	Priority (1-10, 1 is high)	Response
Eastern Europe and Russia supply chain impacts: Political and military uncertainty in eastern Europe is disrupting supplies of key raw materials including steel, palladium, platinum, and nickel. This creates supply bottlenecks for equipment needed in Encom data centres. In addition, sanctions against Russia are a barrier to Encom's expansion plans.	H	H	2	Secure sole supplier contracts for equipment and supplies to ensure preferential treatment. Identify alternative sources where possible as security, to allow switching if and when disruption occurs. Allow for increased costs in equipment when pricing services.
Environmental impact Global regulations concerning the emission of greenhouse gases, the use of energy and the use of water all affect Encom adversely given the impact of data centre operations on the environment. In addition, increasing ESG reporting will make Encom's impacts more visible, risking damage to reputation.	H	H	1	Promote 'green' services at a premium to lead the market, and to reduce the impact of tightening regulation.

Note: H/M/L means High/Medium/Low

END OF EXHIBIT 8

EXHIBIT 9

Singapore Business News article: What you need to know about the updated Personal Data Protection Act

The Personal Data Protection Act was updated in 2020, and the new provisions came into effect from 2021. This article gives a brief summary of the main responsibilities of businesses in relation to the act.

Many businesses collect information about individuals – for example information about customers or employees. The Act applies to personal information where the identity of the individual can be ascertained. The PDPA aims to balance the individual's right to privacy with the needs of businesses to use the data for legitimate business purposes. The Act applies to data held in electronic or non-electronic formats.

Organisations must have procedures in place to ensure that they are accountable for their data protection policies. There must be a designated data protection officer, for example, and there must be a complaints process.

There is an obligation to disclose to individuals why their data is being held and what the business intends to use it for. Individuals must also give consent for their data to be held, and they have the right to withdraw this consent at any time. Consent is usually obtained the first time data is provided by an individual – for example, when a new customer registers with a business, they will be told why the business needs to hold their data, exactly what data will be held, and what processing will be done. Individuals must then consent to this.

Organisations should not hold more information than is needed for the provision of the services about an individual. Clearly a medical organisation would hold sensitive information about their patients' health conditions, but an online retailer of clothes would only require a much smaller amount of data such as the customer's name and address and perhaps their clothes sizes.

Efforts should be made to keep the data accurate, particularly if it is being used to make a decision or disclosed to another organisation. If data is not accurate, then it may harm the individual – for example, if incorrect information is held about an individual's driving records, it may make it harder for that individual to obtain insurance.

Clearly businesses that hold personal data have a responsibility to make sure that data is safe. The Act requires reasonable security arrangements to be in place to protect the personal data. This should reduce the risk of hackers and other cyber criminals accessing the data and using it for illegal purposes. Risks to individuals include scammers, who aim to obtain individuals' bank details, or identity theft, where criminals use detailed knowledge of a person's data to get fake ID documents or even take out loans from banks.

If a data breach occurs, then the organisation may have an obligation to report the breach to the Personal Data Protection Commission as well as to the individuals affected. A notifiable breach is one where the breach is likely to result in significant harm to individuals or affects 500 or more persons.

The amendment to the Act also gives the Commission the ability to impose large fines for non-compliance – up to $1 million, or 10% of turnover, whichever is the larger. So, it is definitely worth ensuring that you are compliant.

END OF EXHIBIT 9

Singapore Data Industry news article: Data centre growth restrictions are to be relaxed!

Data centre growth restrictions are to be relaxed!

The Singapore government imposed a moratorium on the construction of new data centres as it embarked on a review of the data centre industry. As Singapore's Minister for Trade and Industry, Gan Kim Yong, in 2022 said: "This review was necessary because while DCs are important enablers for the digital economy, they are also intensive users of resources, and we had to find a way to manage the growth of DCs in a sustainable manner consistent with our climate change commitments."

Now in 2022…

The moratorium was lifted in early 2022, with the IMDA and Economic Development Board reopening applications for the construction of data centres in the second quarter under a pilot programme prioritising "the calibrated growth of data centres that possess the best-in-class techniques, technologies and practices for energy efficiency and decarbonisation," per Dr Janil Puthucheary, Senior Minister of State for the Ministry of Communications and Information.

At the time of writing, precise guidelines on the evaluation of bids have yet to be formally released, although regulators divulged some of the new criteria to data centre operators in a closed-door session in January 2022. The government will likely approve no more than three new developments of up to 30 megawatts each in

the next 12–18 months, with the combined total additional capacity capped at 60 megawatts.

New facilities are expected to achieve a power usage effectiveness (PUE) ratio of no more than 1.3, a stricter standard than the 2.2 maximum originally mandated under the Green Mark for Data Centres benchmark established by the IMDA and the Building and Construction Authority. In future, operators may also be required to secure Platinum Certification under the Green Mark for Data Centres scheme, as well as approvals from other state agencies for resource allocations, including for land.

END OF EXHIBIT 10

EXHIBIT 11

Suggestions for further research

The following resources may be useful when beginning your research into the case study company. As always, the caveat is to read everything with a healthy dose of scepticism and apply professional judgment. Just because an article is on this list, does not give it legitimacy or relevance. All links were active as at 19 April 2022.

Exhibit 1

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Exhibit 6

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Exhibit 10

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END OF EXHIBIT 11

END OF ADVANCED INFORMATION