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Strategic analysis of the cyber market in Asia:

What are the key considerations for the development of a successful cyber risk management portfolio?

By Chia Jie Jun Jeremy. A dissertation submitted to the Chartered Insurance Institute (CII) in partial fulfilment of the requirement for the accreditation of Fellowship of the CII (FCII).

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Contents

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All authors named contributed to this report in their own personal capacity. The views expressed are their own and do not necessarily represent the views of their respective employers or the Chartered Insurance Institute.

Background

Between 12 and 14 June 2018, barely two weeks earlier from the time this dissertation is being written, was the historical 2018 North Korea–United States summit which was held in Singapore. In this first-ever summit meeting between the two leaders of the Democratic People's Republic of Korea (North Korea) and the United States of America (USA); critical talks were held to discuss how they might reduce the military tension in the Korean peninsula and the potential permanent denuclearization of North Korea.

On 12 June alone, "Singapore was the top cyber-attack target around the world during the Trump-Kim summit, with the country experiencing close to 40,000 attacks" and "Singapore also received up to 4.5 times more attacks than the United States or Canada on both days". (Choo, 2018).

Background

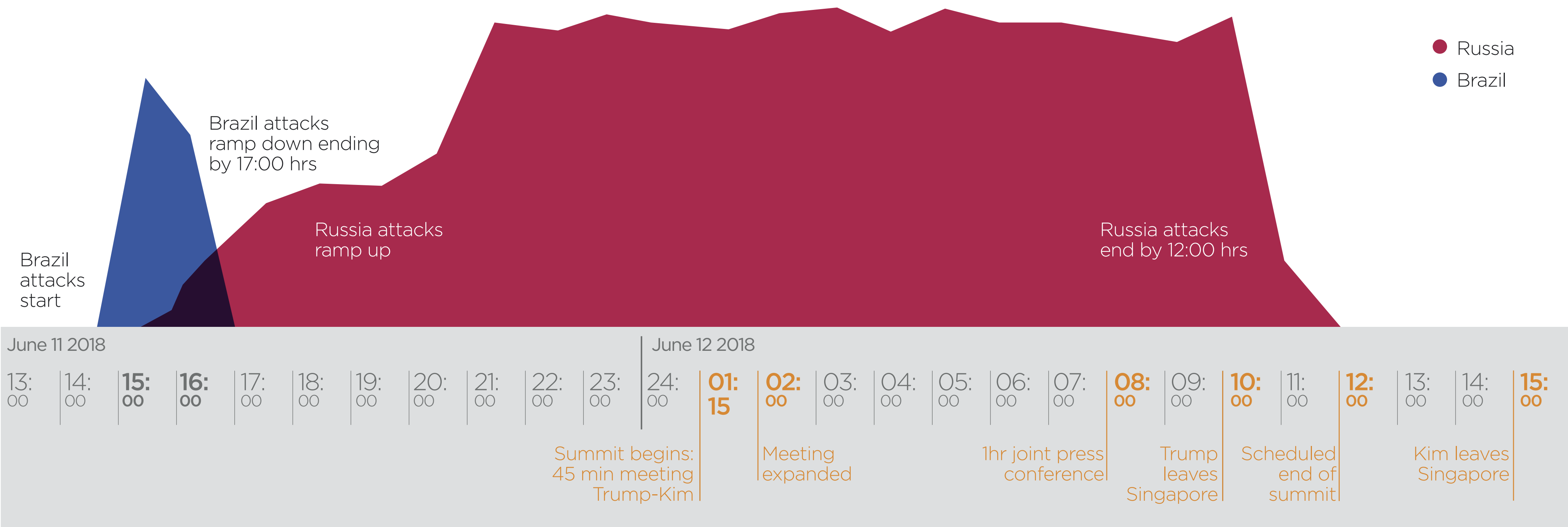

Fig 1. Timeline of Attacks on Singapore (Choo, 2018)

According to a recent study by Lloyd's and the University of Cambridge, cyber threats are 1 of the 22 major global threats. The threat of a cyber-attack is ranked fourth in Singapore at approximately 10.130% of Singapore's Total GDP at Risk ($3.24 billion).

As a Singaporean and underwriter based on Lloyd's Asia platform, in Singapore, I have no doubt that this would lead to an increase in demand for cyber insurance. This event, being so close to home, has inevitably left me with a greater appreciation of the severity of cyber risk exposure, and also a desire to better understand the cyber insurance market and how insurance companies could develop their own successful cyber risk management portfolio - to reduce the vulnerability of our economies by increasing the overall market availability of cyber risk capacity. For the reasons stated earlier, I have chosen this particular subject for my dissertation.

Context

This dissertation will be written and discussed from the viewpoint of an insurance company, referred to as ABC for confidentiality purposes, which wants to develop a successful cyber insurance portfolio in the light of recent global events. The following will also be in the context of a division of ABC - the Lloyd's Syndicate on the Lloyd's Asia, Singapore platform: ABC Syndicate 1234. Some of the corporate goals and assumptions regarding ABC/the Cyber Market are listed opposite:

- **A** ABC should have a significant presence in the cyber insurance market.
- **B** ABC has no experience of underwriting cyber insurance.
- **C** There are many insurers in the market.
- **D** It is predominantly distributed via brokers.
- **E** There is demand for it from ABC's existing customers.
- **F** ABC might lose a number of key accounts if it is unable to offer cyber risk coverage.
- **G** There is a lack of understanding about what cyber insurance is intended to cover.
- **H** There is a lack of historical claims data.
- **I** Some insurers in the market are offering cyber insurance as an extension to existing covers.
- **J** ABC should develop a financially profitable cyber insurance portfolio.

Context

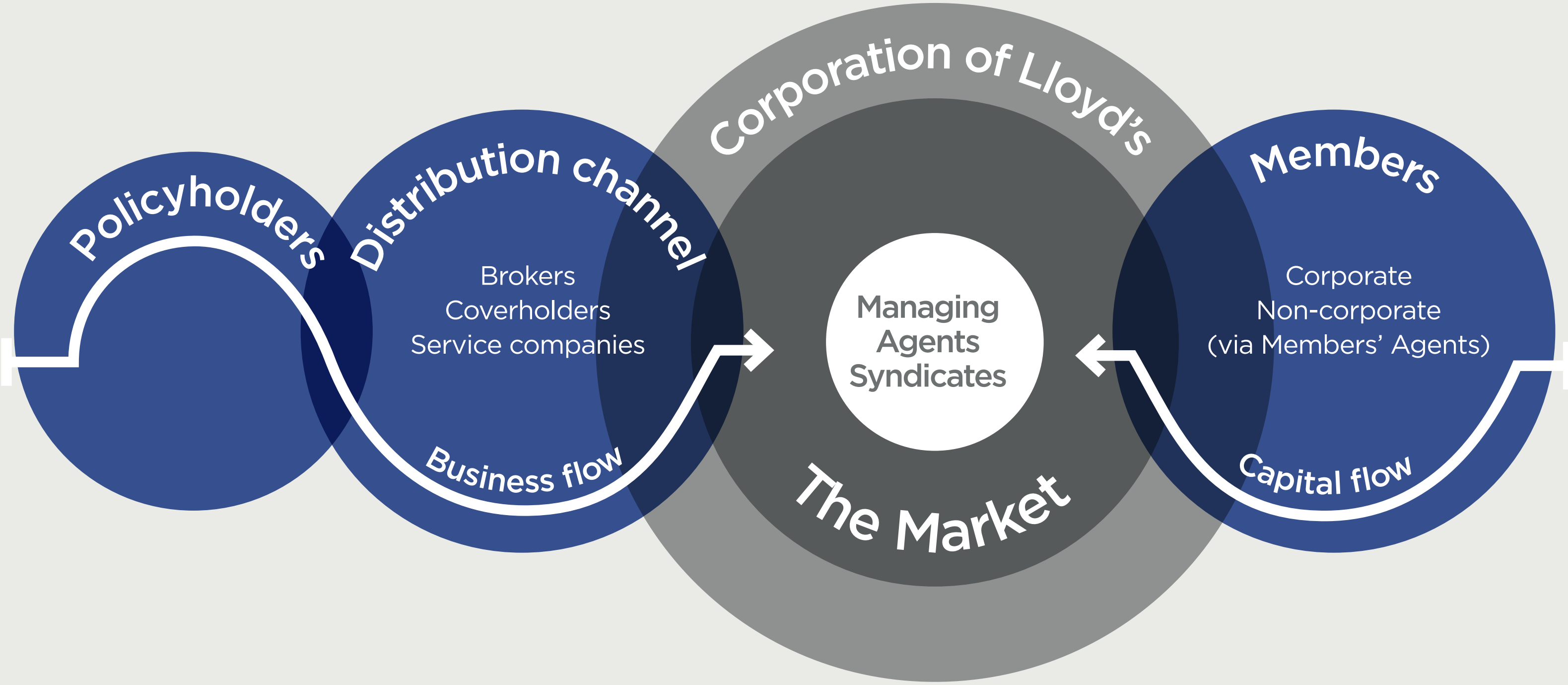

Fig 2. Market Structure of Lloyd's (Lloyd's, 2010)

Lloyd's, with a history of over 300 years since its establishment in Edward Lloyd's coffee house in 1686, has grown to be so much more than just a place where only ship-owners met people with capital for marine insurance. It is now the world's leading specialist property and casualty insurance market that covers more than 200 territories and countries with 85 syndicates managed by 56 managing agencies across the globe. It is innovative and dynamic; and hence also usually the pioneer in insuring novel, unique and complicated risks (Lloyd's, n.d.). Therefore, where else better to develop and grow a successful cyber risk management portfolio than on the Lloyd's platform!

Strategic Analysis of the current cyber market (using Porter's 'Five Forces')

Michael E. Porter, Professor at Harvard Business School developed the "Porter's Five Forces" which is essentially an analysis model which identifies the five competitive forces of any firm. According to Porter, the five competitive forces are:

1
threat of new entrants

2
threat of substitutes

3
bargaining power of customers

4
bargaining power of suppliers

5
competitive rivalry

In the context of this assignment, barriers to entry would be a threat to new entrants, the substitutes would be existing Syndicates on the Singapore/ Lloyd's Asia platform, customers would be the insureds and their brokers, whilst the suppliers could be defined as the reinsurers which allow insurers like ABC to have more capacity to underwrite (Joy, 2015) (Giving Incorporated, n.d.) (Porter, The Five Competitive Forces that Shape Strategy, 2008).

Strategic Analysis of the current cyber market (using Porter's 'Five Forces')

Threat of new entrants (Moderate)

The components for consideration for the level of threat of new entrants to the cyber insurance market can be broadly classified into two main categories: a) the barrier to enter/exit the cyber insurance market; and b) the level of attractiveness to enter into the cyber insurance market. The factors behind a) the barrier to enter/exit the cyber insurance market are usually the barriers to enter/exit the cyber insurance market include capital, knowledge required ("**B**", "**G**" and "**H**"), economies of scale of insurers with existing cyber insurance products, and access to distribution channels. On the other hand, b) the level of attractiveness to enter into the cyber insurance market usually revolves round the level of product and industry profitability.

Although in the policy year ending 2017, the cyber insurance market saw a 5% improvement (to 45%) from an already-decent loss ratio of 50% (Reuters, 2017), and hence experienced a level of relatively high product and industry profitability; given that the barriers to entry of the cyber insurance market are significantly high due to the high levels of initial investment in product/industry knowledge and financial capital required, the level of threat of new entrants is deemed to be Moderate.

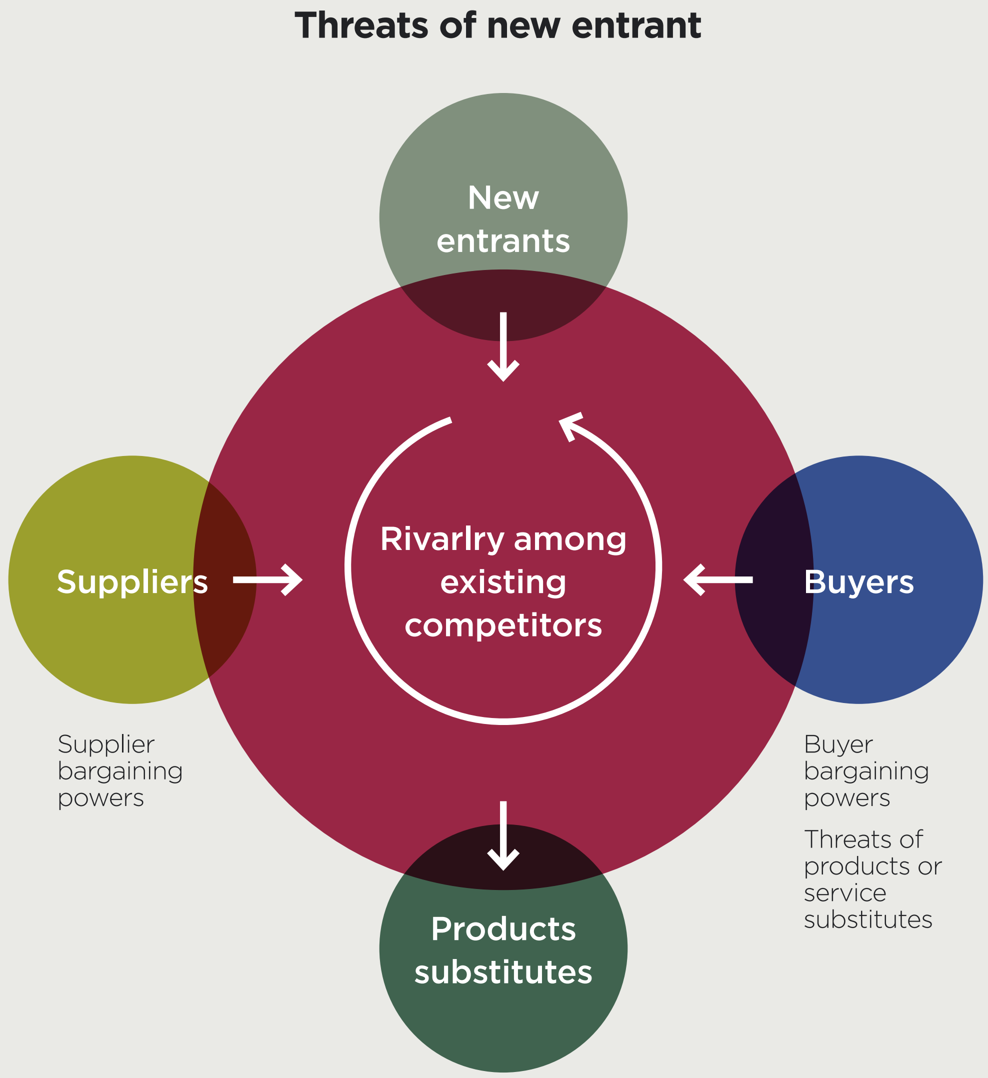

Fig 3. Porter's Five Forces Diagram (Porter, The Five Competitive Forces that Shape Strategy, 2008)

Strategic Analysis of the current cyber market (using Porter's 'Five Forces')

Threat of substitutes (Moderate-Low)

An alternative product that is similar in function, and is able to meet the same economic need, can be considered to be a substitute. Some of the factors behind the level of threat of substitutes include, but is not limited to, perceived level of product differentiation from other products in the cyber insurance industry ("**I**"), price of substitute relative to the substitute's performance ability (in this context, performance ability can be interpreted as policy coverage); and both the ease and cost of switching to another cyber product and, hence the propensity of the insured to substitute their current insurer for their cyber exposure.

Although it is relatively easy for an insured to choose another insurer since there are also a number of insurers who carry cyber insurance products ("**C**"), this can usually be done only during the annual renewal period and even that too is usually uncommon unless there is a real need that calls for it. The insured could also be dependent on the ability of brokers which would have a direct impact on the easy and cost of switching insurers ("**D**"). Hence, the level of threat of substitutes is deemed to be Moderate-Low.

"Cyber threats are escalating, with concern that U.S. infrastructure and businesses could be under attack from cyber criminals with varying agendas. Growing technology risks associated with the expansion of the mobile workforce, broad adoption of 'bring your own device' (BYOD) policies, and innovations, such as wearable technologies and the internet of things (IoT), will only expand threats to data privacy and security. Cyber-attacks and data breaches are likely to be the rule rather than the exception for businesses of all types going forward. Not surprisingly, the number of businesses considering purchasing cyber coverage for the first time is increasing. Governmental responses, including the uncertain fate of U.S. Safe Harbor agreements with Europe, evolving U.S. state laws and federal oversight through audits and examinations conducted by the SEC, FTC, FCC and HHS/OCR, are likely to add further hardening pressure for buyers of cyber insurance".

An abstract from a report by Willis Towers Watson in respect of the cyber market outlook (FINEX Cyber Team, 2016).

Strategic Analysis of the current cyber market (using Porter's 'Five Forces')

Bargaining power of customers (Moderate-High)

In the context of the insurance sector, the insured and their brokers could be considered as customers since they are the ones who would purchase, or facilitate the purchase of insurance coverage from insurers like ABC.

Conventionally, the customer's buying power has a positive correlation with the number of substitutes available. Hence, given the creation of relatively fewer cyber insurance products, and a limited supply of available capacity for cover in the cyber insurance market ("**E**"), the customers (potential insured) should theoretically have a low bargaining power. However, although the cyber insurance market is still "far from saturated" (Wilbert & Kroger, 2018) with demand exceeding the supply of available capacity for cover in the cyber insurance market ("**E**"), the customers still have relatively significant power to back its demand because of the other business and risks it brings to insurers ("**F**"). Hence, the level of bargaining power of customers is still considered to be relatively high.

However, the bargaining power of the customers could be reduced slightly given the gradually hardening of the cyber insurance market environment.

The insurance underwriting cycle, also known to some as simply the insurance cycle, is used to illustrate the cyclical tendencies of the insurance sector to periodically rotate between periods of general profitability and periods of general non-profitability (Lloyd's, n.d.). As mentioned by Willis Towers Watson regarding the outlook on the cyber market, the limited cyber insurance capacity and heightened scrutiny of cyber underwriting (due to the large and relatively new exposures), has resulted in a hard market with an increase in premium levels and have dampened the level of bargaining power of potential insureds. Hence, the overall level of bargaining power of the customers is considered to be Moderate-High.

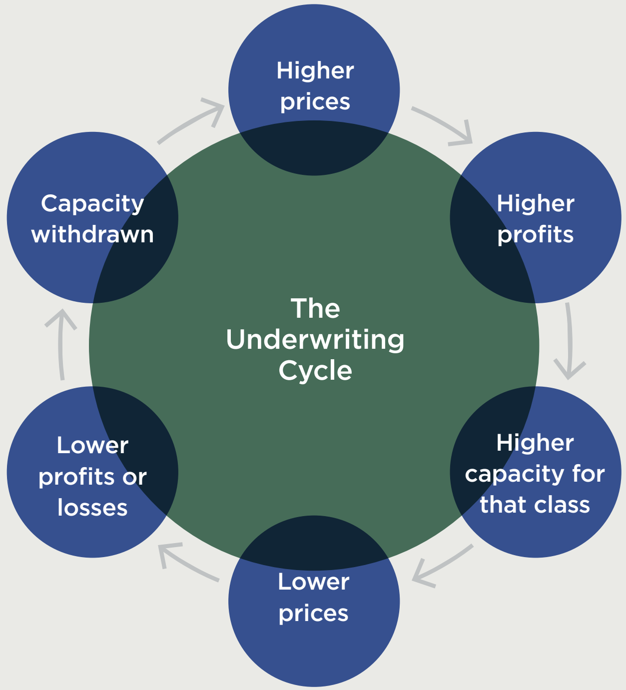

Fig 4. The Underwriting or Insurance Cycle (Darlington, 2013)

Strategic Analysis of the current cyber market (using Porter's 'Five Forces')

Bargaining power of suppliers (Moderate-Low)

In the context of the insurance sector, reinsurers could be considered as suppliers since they provide insurers will the ability to transfer a portion of the risk to them and thus free up more of the insurer's capacity for the insurer to insure more risks from the insurance market.

As mentioned in the earlier section, conventionally, customer's buying power has a positive correlation with the number of substitutes available. Hence, similar to the insurance market, given the creation of relatively fewer cyber reinsurance products and a limited supply of available capacity for reinsurance cover in the cyber reinsurance market, the customers (insurers) should theoretically have a low bargaining power. However, the customers (insurers) still have relatively significant power to back its demand because of the other business and risks it brings to reinsurers. Hence, the level of bargaining power of reinsurer (suppliers) is considered to be relatively low.

The reinsurance underwriting cycle is also similar to that of the insurance underwriting cycle. As mentioned in the earlier section, the availability of underwriting capacity has a direct impact on premium levels and customers' bargaining power. With the limited cyber reinsurance capacity and heightened scrutiny of cyber reinsurance underwriting (due to the large and relatively new exposures), the cyber reinsurance market is also experiencing a hard market with an increase in premium levels and the slight dampening of potential insureds' bargaining power. Hence, the overall level of bargaining power of the suppliers is considered to be Moderate-Low.

Strategic Analysis of the current cyber market (using Porter's 'Five Forces')

Competitive rivalry (Low)

Despite the hardening cyber insurance market and rising cyber insurance premium levels, insurers are still relatively conservative in their risk appetite and with their cyber insurance capacity:

Competitive rivalry is usually the most significant factor for the level of competitiveness in the industry for most industries. Competitor/insured's ability to innovate and enjoy sustainable competitive advantage is just one of the many determinants that could influence this factor. However, in this relatively new class of insurance business of less than two decades old, "If not the first, at least one of the first, cyber liability policies as we now call them was developed for the Lloyd's of London market in 2000" (Kesan, Majuca, & Yurcik, The Economic Case for Cyberinsurance, 2004), with the relatively little supply of cyber insurance capacity and products, the overall level of competitive rivalry can be considered to be Low.

> *"The underwriting process for new and renewal business, for both primary and excess coverage, is taking longer due to the scrutiny that carriers are applying to security controls, processes and procedures. Certain underwriters require a conference call to address these issues before they will look at an application. In some cases, detailed risk assessments may be required prior to quoting."*
> (FINEX Cyber Team, 2016).

Strategic Analysis of the current cyber market (using Porter's 'Five Forces')

Porter's Five Forces

	Threat of new entrants	Threat of substitutes	Bargaining power of customers	Bargaining power of suppliers	Competitive rivalry
Low					●
Moderate - Low		●		●	
Moderate	●				
Moderate - High			●		
High					

Table 1. Porter's Five Forces analysis and their overall evaluations of the current cyber market

Overall analysis and evaluation of the Cyber Market

Porter's Five Forces analysis and their overall evaluations of the current cyber market are summarised in the table above:

With the strategic analysis and the overall evaluation of the various aspects of the current cyber market, it is my opinion that the cyber insurance market is ready for ABC, or any other insurance company for that matter, to enter.

The key considerations of a strategic underwriting plan for the development of a successful cyber risk management portfolio

A business strategy is essentially the strategic alignment of the company's operating philosophy to the present and future risk environment (Watkins, 2007).

The Board's requirement and hence, the current business strategy of ABC is for ABC to have a significant presence in the cyber insurance market and for ABC to develop a successful cyber insurance portfolio. To support the overarching business strategy of ABC, ABC should have a strategic underwriting plan that supports and ensures its success. It is my recommendation that ABC should devise a strategic underwriting plan that involves three phases:

"A business strategy is a set of guiding principles that, when communicated and adopted in the organization, generates a desired pattern of decision making."

Dr. Watkins, professor at The Kennedy School of Government at Harvard University, the Harvard Business School, and INSEAD.

Phase 1

increase cyber insurance knowledge

Phase 2

increase profitability

Phase 3

reduce volatility

Phase 1 will provide ABC with product and market knowledge. Once ABC has developed its products and cyber insurance portfolio, ABC should proceed to **Phase 2** to increase the profitability of its cyber insurance products, and finally, to protect earnings ABC should introduce **Phase 3** to ensure smooth financial performance/return to all ABC stakeholders.

The key considerations of a strategic underwriting plan for the development of a successful cyber risk management portfolio

Phase 1 - Increase cyber insurance knowledge

The objective of Phase 1 is to provide ABC with a good understanding of the cyber insurance market and the knowledge of product development and creation of its cyber insurance portfolio; and also addresses the fundamental issues of:

- B **ABC has no experience of underwriting cyber insurance**
- G **There is a lack of understanding about what cyber insurance is intended to cover**
- H **There is a lack of historical claims data, and**
- J **ABC should develop a financially profitable cyber insurance portfolio.**

By case-studying and learning from both the successes and failures of its competitors, and identifying and understanding patterns, relationships and trends in the cyber market, ABC will gain competitive intelligence that will allow it to formulate a stronger business strategy that will enable ABC to better advertise, place, underwrite, disseminate and innovate their own cyber products. Innovation birthed from the expertise and experience gained from scrutinising large volumes of relevant competitor data could even lead to innovative product differentiators in the cyber market that are disruptive and are game changers.

Additionally, by constantly updating competitor data, ABC can prevent its underwriting department from being complacent and prevent them from adopting no-longer-relevant trends of thoughts or products that are no longer in sync with market-developments. Being aware of fresh ideas and developments in the sector will help ensure that ABC's strategic underwriting plan and strategy remains relevant to the cyber insurance market and its developments.

Other avenues from which ABC could gain knowledge about the cyber insurance market and products include collaborating with reinsurers and following insurers on the Lloyd's market ("**A**" and "**B**"). ABC could collaborate with established reinsurers in the cyber insurance market to learn from them about pricing cyber insurance risks and how to develop a successful cyber insurance portfolio that is suitable for ABC's risk appetite. ABC could also take advantage of its position on the Lloyd's platform and be a following insurer that takes a small line size behind a more experienced lead insurer. The lead insurer would front the terms and conditions of the policy from which ABC's new cyber insurance underwriting could use as case studies; and learn more about the different types and forms of cyber insurance products and its various clauses and extensions ("**G**").

> *"Learn from the mistakes of others. You can't live long enough to make them all yourself."*
>
> Eleanor Roosevelt, US diplomat & reformer (1884-1962)

The key considerations of a strategic underwriting plan for the development of a successful cyber risk management portfolio

By being on the Lloyd's platform, ABC can stand to participate in a greater number of cyber risks, grow its cyber insurance portfolio and gather more historical claims data, while not exceeding its capacity for insurance. ("**H**" and "**J**").

Therefore, knowledge from ABC's cyber insurance competitors and market leaders will help to contribute towards the overall success of ABC's business strategy and eventually allow ABC to aggressively gain market share as the increase in both the underwriting profit and savings in the long run from operational effectiveness and quality that will already help ABC to increase their overall profitability; which will be further elaborated upon in the following section.

With increase in knowledge, ABC could stay relevant and ahead of its peers by being able to react quickly and seize opportunities. ABC needs knowledge of its competitors to be aware of the developments in the marketplace. Most critically, it needs to be aware of what products its competitors are offering and how these competitors price the products. By being aware, ABC's underwriting department would then be able to better augment its cyber product prices and know when to expand/restrict the product policy coverage or even discontinue the product entirely depending on ABC's business strategy of either increasing their profit margin or gaining market share (Connell Curtis Group, 2018).

With greater knowledge of its competitors, ABC will be able to better analyse and predict competitors' strategy and proactively put in place strategic responses ahead of time. Hence, competitor knowledge can affect the strategic underwriting plan to a large extent.

> *"...the size of the company is immaterial when it comes to having a competitive intelligence program. The neighbourhood Chinese takeout needs competitive intelligence as much as a Fortune 500 company."*
>
> Jay Dwivedi, President of Xinvest Consultants

Phase 2 - Increase profitability

Like all other insurers, one of the core components of ABC's business strategy is to increase the profitability of its cyber insurance products. The objective of Phase 2 is to increase the overall profitability of ABC by increasing underwriting profit, improving operational effectiveness and quality, and increasing investment income.

This phase also addresses the fundamental issues of:

C **There are many insurers in the market",**

D **It is predominantly distributed via brokers",**

E **There is demand for it from ABC's existing customers",**

F **ABC might lose a number of key accounts if it is unable to offer cyber risk coverage", and**

I **Some insurers in the market are offering cyber insurance as an extension to existing cover"**

The key considerations of a strategic underwriting plan for the development of a successful cyber risk management portfolio

Increase underwriting profit

Despite having many other insurers in the cyber insurance market ("**C**"), a hardening market with demand exceeding supply ("**E**"), as discussed earlier, the cyber insurance market is still "far from saturated" (Wilbert & Kroger, 2018). Generation of profit by means of underwriting premium is thus, an effective means with a hard market environment. However, due to the uniqueness of the cyber insurance market where the customers still have relatively significant power to back its demand because of the other business and risks it brings to insurers ("**F**"), a focus on writing better quality risks with more relevant policy covers alone to further increase the retention of underwriting profit may be insufficient. ABC might have to consider offering cyber insurance as an extension to existing cover ("**I**"), offering cyber insurance as a standalone cover, and to increase its cyber insurance products' distribution network of brokers, cover holders, etc. ("**D**").

Increase operational effectiveness and quality

With increased operational effectiveness, ABC could also reduce operational costs and hard leakages such as the difference between actual and optimal cyber claims settlement (Claims Leakage) (Maddox, 2015).

By improving the effectiveness and flexibility of operational processes, ABC stands to gain not only tangible advantages like a reduction in the cost of operational expenses but also intangible advantages like that of increased competitive advantage over its business rivals through the development of valuable customer relationships with the consistent provision of quality and reliable service by ABC's staff and support services.

Increase investment income

Due to the role of the insurance company and its financial obligation to make timely claims payments, even if the claim is unexpected or significantly large, insurance companies are traditionally inclined to invest the bulk of their earned premiums in relatively low risk but also low-return financial assets that the insurance company could liquidate at short notice to help ensure claims payment is timely and in compliance with relevant statutory and regulatory legislation. As the regulatory body for Singapore's financial industry and the nation's central bank, the Monetary Authority of Singapore (MAS) closely monitors the macroeconomics of new trends and possible weaknesses that may exist within Singapore's financial industry.

The key considerations of a strategic underwriting plan for the development of a successful cyber risk management portfolio

Phase 3 - Reduce volatility

The objective of Phase 3 is to reduce volatility in ABC's portfolio of cyber insurance risks to ensure smooth financial performance/return to all ABC stakeholders. This will be critical to the success of ABC's cyber insurance portfolio; and also addresses the fundamental issues of:

- A **ABC should have a significant presence in the cyber insurance market, and**
- J **ABC should develop a financially profitable cyber insurance portfolio.**

There are five conventional methods for risk treatment or the reduction of volatility (Spacey, 2015):

1. **Risk Avoidance**
2. **Risk Reduction**
3. **Risk Transfer**
4. **Risk Retention**
5. **Risk Sharing**

Risk Avoidance

By employing a strong and capable team of underwriters, ABC is more able to identify and avoid poor risks or risks that fall outside the company's risk appetite. It is more prudent to avoid risks of poor quality, or risks with too thin a pricing, than to underwrite them and sustain a heavy loss ratio when the claims materialise.

Risk Reduction

ABC's "unsystematic" risk (Lioudis, 2018) and exposure to risk volatility can be reduced through the gradual increase in portfolio diversification. Post-loss analysis of most unnaturally high levels of natural catastrophe losses experienced by insurers revealed that those losses were made that much more significant due to the limited number of lines and lack of portfolio diversification.

ABC should take advantage of its presence on the Lloyd's platform and have Risk Reduction by diversification of its cyber insurance portfolio through Risk Sharing by writing more risks with smaller line size; thus reducing ABC's portion of liability for each individual cyber risk/insured. As ABC diversifies its cyber insurance portfolio more, the less correlation there will be among the risks that it underwrites and thus; the more limited the maximum estimated exposure to ABC will be at any given period of time and hence an increased chance of the overall success of the portfolio ("**J**"). By doing so, ABC could also test the viability of its cyber insurance products and work to improve the underwriting of its cyber risks. Once confident, ABC could continue to grow its cyber insurance portfolio and enlarge its proportion against the overall gross written premium of ABC; and underwrite more risks in the Lloyd's market (with more risks of smaller line size) to eventually have a significant presence in the cyber insurance market ("**A**").

The key considerations of a strategic underwriting plan for the development of a successful cyber risk management portfolio

Risk Transfer

Reinsurance can be in the form of proportional or non-proportional reinsurance. As an insurance company, ABC can choose to be a cedent and transfer a portion of its risks to a reinsurer to further reduce its residual exposure. By buying reinsurance from a reinsurer, ABC will also enable itself to avail more capacity to increase the volume and spread of its portfolio of risk. Hence, reinsurance not only transfers a portion of the risk away from the primary insurer, it also allows ABC to reduce the volatility of its portfolio. It is also especially critical that ABC ensures that its portfolio is within the critical limit so as to ensure that ABC is compliant with statutory and regulatory requirements; and that ABC's capital is still adequate for the risks underwritten.

Another alternative form of Risk Transfer is by means of catastrophe bonds.

Risk Retention

The portion of the risks that ABC keeps is also known as risk acceptance or self-insurance. It is crucial that ABC sets aside sufficient funds for claims reserving of the portion of risk retained. An insurer also usually earns and retains premium for the portion of risk it underwrites and retains.

Risk Sharing

As mentioned earlier in Risk Reduction, as a division of ABC, the Lloyd's Syndicate on the Singapore/Lloyd's Asia platform, ABC Syndicate 1234, is able to share the risk with other Syndicates on the Lloyd's platform. The amount of insurance risk that is accepted by ABC's underwriters or which ABC underwriters are able and willing to accept is often referred to a line on a slip. This line is often expressed in terms of a percentage of the limit of liability.

By writing more risks with smaller line size, ABC's portion of liability for each individual cyber risk/insured is reduced by sharing of risk with the other syndicates on the Lloyd's platform. This will allow the volatility of ABC's cyber insurance portfolio to be reduced through diversified and thus increasing its chance of success ("**J**") while also allowing ABC to underwrite more cyber risks and eventually have a significant presence in the cyber insurance market ("**A**").

Conclusion

According to the Lloyd's City Risk Index, which studied a total of 279 cities across the world, out of the $320 billion Gross Domestic Product (GDP) at risk, approximately 10.2% (~$33 billion) was due to Technology and Space threats; with cyber-attacks being the most important and severe of them all.

Singapore ranks 47 on the Global Risk Ranking with cyber-attacks being the top man-made threat at 10.1% of its GDP at risk ($3.24 billion). However it is my opinion that these statistics might be deflated due to under-reporting; since there is no regulatory obligation for companies to report and some companies might not make claims or report cyber-attacks due to the potential reputational implications.

Conclusion

The potential loss of productivity and economic output is far too significant to be ignored. One of the possible solutions and my recommendation to improve Asia's resilience against cyber threats, is to increase the availability of insurance capacity and insurance penetration. As pointed out by Richard Green, Managing Director and Cyber Leader of Marsh (Asia), "(Cyber insurance is) not a nice-to-have, but a must-have". Having analysed and evaluated the current cyber market, using Porter's 'Five Forces', I believe that the cyber market is ready and suitable for entry by insurers and reinsurers alike.

Cyber insurance, being relatively much younger than many of the more established insurance lines, with the first product of its kind only launching in 1997 (Wells, 2018), has a relatively limited product range and capacity. Hence, to address this gap in the cyber market's demand/needs and supply/capacity, insurers should strive to develop a successful cyber portfolio. This is by no means straightforward as it would require immense experience, expertise and knowledge.

As a result of my research and analysis for this dissertation, I firmly believe that the first step toward developing a successful cyber risk management portfolio is to have a strategic underwriting plan that covers key aspects of the development process. These aspects could be categorised into 3 phases:

- **(Phase 1)** increase cyber insurance knowledge
- **(Phase 2)** increase profitability
- **(Phase 3)** reduce volatility

By (Phase 1) providing ABC with a good understanding of the cyber insurance market and the knowledge of product development and creation of its cyber insurance portfolio, (Phase 2) increasing the overall profitability of ABC through increasing underwriting profit, improving operational effectiveness and quality, and increasing investment income, and by (Phase 3) reducing volatility in ABC's portfolio of cyber insurance risk to ensure smooth financial performance/return to all ABC stakeholders, ABC will be able to meet the Board's requirements regarding cyber insurance (establishing of a significant presence in the cyber insurance market and to develop a successful cyber insurance portfolio), and address the information and concerns regarding cyber insurance. From a big-picture perspective, it is my opinion that this would help to reduce the vulnerability of our economies by increasing the overall market availability of cyber risk capacity.

While the insureds should do their part to help in the maturity of the cyber market, risk management systems and procedures by sharing data about cyber-attacks that they experience; I think that there is a compelling and urgent need for insurers to quickly develop the capacity to take on cyber risks from the market to safeguard our economies. As the famous British economist John Maynard Keynes once said, "It is better to be roughly right than precisely wrong". In the context of this dissertation, to safeguard the economic interests of the world, it might be better for insurers to take the initiative to push and develop cyber products and portfolios, and constantly work to improve them, rather than being stymied in development paralysis by waiting for 'perfect data' before doing so.

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COH_J012808 05/20