

MANAGING AND MEASURING OPERATIONAL RISK FOR INSURANCE COMPANIES IN ASIA

SAS ERM WORKING PARTY



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Operational Risk in Asia - Content

- 1. Introduction and definition**
 - 2. Applicable regulations in Asia Pacific and in the rest of the world**
 - 3. Managing operational risk**
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1. Introduction & Definition

MAS issued in June 2012 a consultation paper on the review of the risk based capital framework: the RBC2. Among the proposed amendments is a new risk charge aiming to cover *Operational Risk*.

SAS ERM Committee decided to set up a dedicated **Working Party** in order to provide the industry with insights regarding *Operational risk management and measurement*.

This document aims to present the **working party early findings**.

1. Introduction & Definition

Operational Risk is the risk of loss resulting from inadequate or failed internal **processes**, **people** and **systems**, or from **external events**.

Operational Risk is the **residual risk** not covered by **other categories** of risk, including insurance, financial, credit and liquidity risk.

Operational Risk deals with the **governance** and **management** of **processes** and **controls** in an organization that cut across all **risk categories** including insurance, financial, credit and liquidity risk.

Examples of operational losses in the Financial Services industry are provided in Appendix 1.

1. Managing operational risk: Comparing OR to other risks

	Market / Insurance / Credit Risk	Operational Risk
Definition	<ul style="list-style-type: none"> - Well-defined - Consistent taxonomy 	<ul style="list-style-type: none"> - Lack of universal definition - Taxonomy is wide ranging
Data	<ul style="list-style-type: none"> - Mainly transactional - available electronically - Usually structured - Complete, quantifiable 	<ul style="list-style-type: none"> - Mainly ad-hoc - Incomplete, wide sources - Often not structured - Mostly subjective
Systems & Methodology	<ul style="list-style-type: none"> - Matured - Systems are generally available - Modelling techniques defined - Best practice methodology defined 	<ul style="list-style-type: none"> - Developing - Data relationship focus - Modelling lacking of consistency - No commonly accepted methodology
Function & Personnel	<ul style="list-style-type: none"> - Academic / highly skilled - Small team of specialist - Clear ownership 	<ul style="list-style-type: none"> - Everyone - Largely generalist - Ownership is not well-defined

2. Applicable regulations in Asia Pacific and in the rest of the world

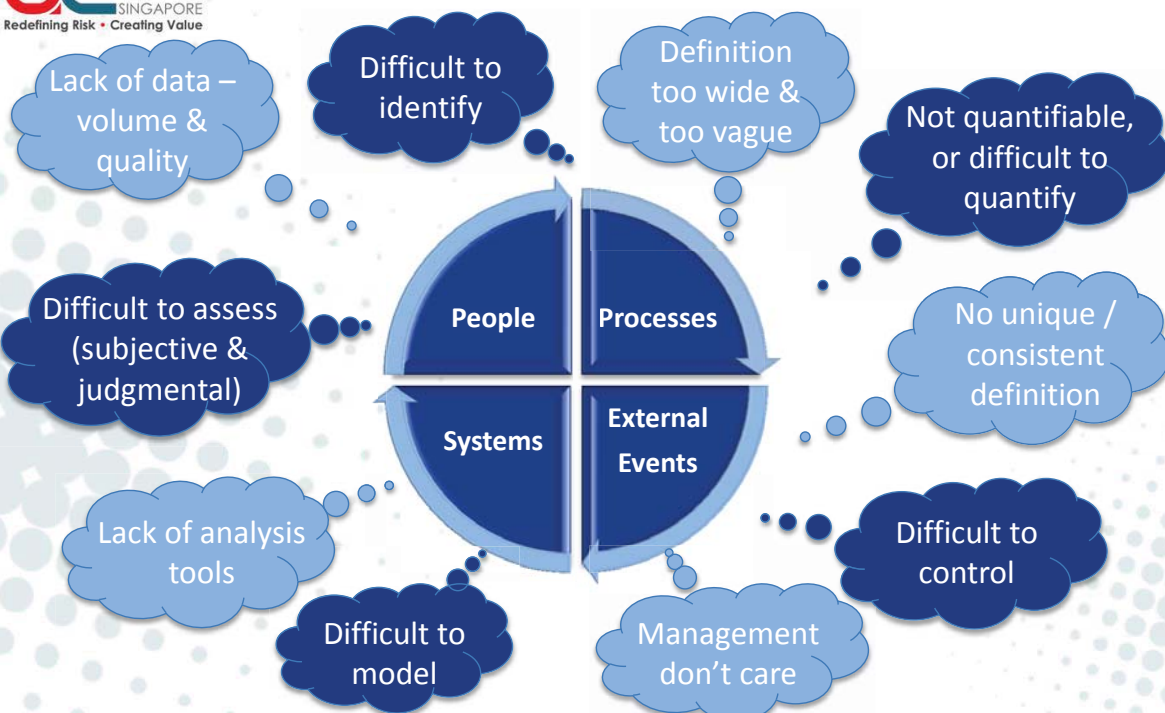
- The **working party** reviewed the existing regulations and project of new regulations in most of the **Asia Pacific** countries and in some other significant countries **in the rest of the world**.
- Some jurisdictions already require or are in the process of requiring the **implementation of comprehensive ERM** that covers the management of **operational risks**.
- In those cases, insurance companies are expected to **identify, document and monitor** the **operational risks**, the board of directors being ultimately responsible of their efficient management.

2. Applicable regulations in Asia Pacific and in the rest of the world

- Among the 8 jurisdictions using already **RBC model in Asia**, (namely Australia, Indonesia, Japan, Korea, Malaysia, Singapore, Taiwan and Thailand):
 - 3 of them have a **explicit risk charge for operational risk (Australia, Japan and Taiwan)**.
 - 1 of them **intends to implement** an additional risk charge for operational risk (**Singapore**).
- The operational risk charge calculation varies from one country to another (refer to appendix 2), it mostly consists in:
 - Applying a **risk factor** (from 0.15% to 4% depending on the line of business)
 - To an **aggregate** (such as earned premium or gross policy liabilities).

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3. Managing operational risk: Challenges



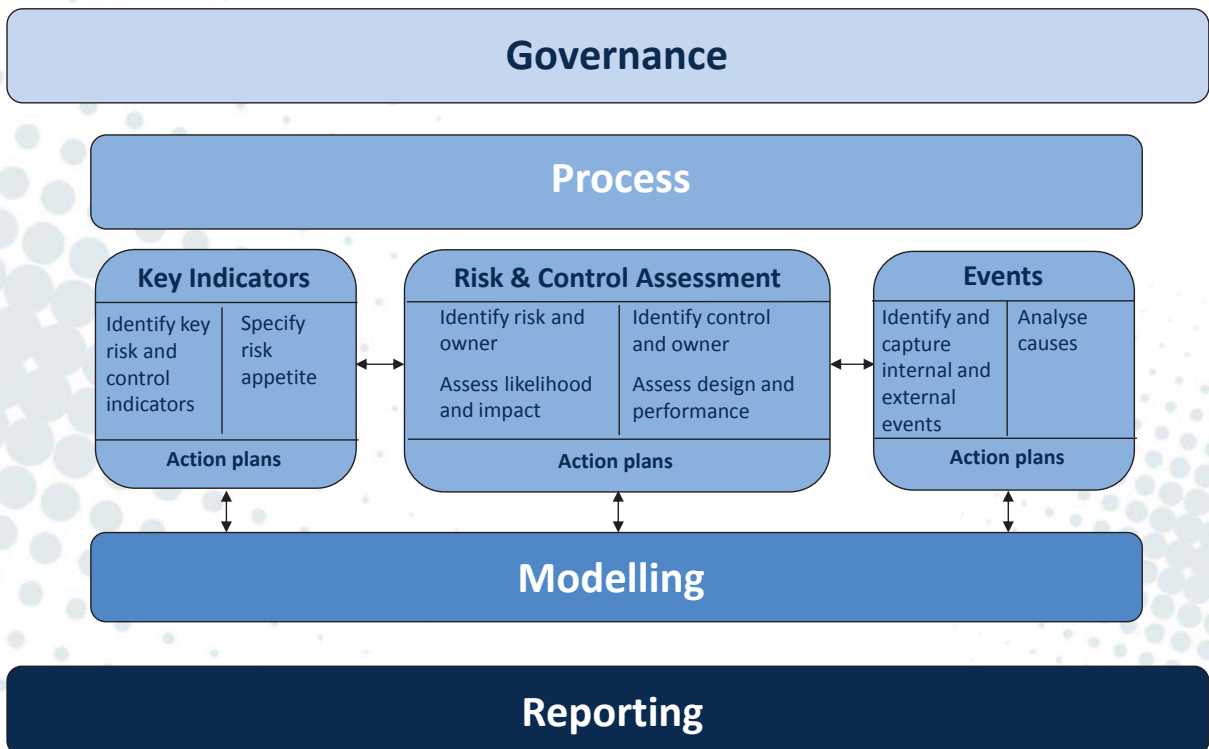
Businesses are ultimately comprised of people. Companies must implement systems & controls to manage people risk, includes the behavior of the business to its people and behavior of people to the business.

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3. Managing operational risk: Effective management

- For Operational Risk Management to be effective it has to be:
 - Given **Board sanction** for resources
 - **Reported up to the Board** for appropriate action
 - Introduced into **every layer** of the business structure
 - **Documented and communicated** to every staff member (regularly)
 - Built into **staff performance objectives**
 - Becomes part of the organisational **culture**

3. Managing operational risk: Typical ORM framework



3. Managing operational risk: Defining ORM governance

“In broad terms, effective governance enables a firm’s board and executive to interact effectively to deliver a firm’s agreed strategy – and, in particular, it is about managing the risks the firm faces.”

FSA Website 2012

- **Strategy**
 - An effective corporate **governance framework** allows a firm to manage all aspects of its business in order to **meet its objectives**
- **Process**
 - Corporate governance is the **set of processes, policies, guidelines and management practices** that create a control framework
- **People**
 - It incorporates the **relationships among the stakeholders**

3. Managing operational risk: Defining ORM Process



4. Measuring operational risk: The loss data challenge

Availability and **quality** of relevant *operational loss* data is a key challenge:

- **Quantity issues:** some operational loss are by nature rare or not subject to reporting.
- **Quality issues:** loss data may be incomplete, truncated, censored, reporting bias, mis-classified, heterogeneous, etc.

For the purpose of modeling, the loss data used are often a mix of **internal/external, hard/soft** loss data.

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4. Measuring operational risk: The loss data challenge

Source: Internal / External

- Very few insurance companies started collecting **internal operational loss data** over a sufficient period of time in order to be relevant.
- **External data** can be public or consortium data. Consortium loss data are expected to be bigger and more reliable, but may be expensive.

The addition of **external data** to **internal data** allows bringing **high severity and low frequency input**.

This **combination of different sources of data** may require sophisticated **scaling techniques**.

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4. Measuring operational risk: The loss data challenge

Nature : Hard / Soft

- **Hard data** are collected through a **robust and systematic process**.
- **Soft data** are based on **empirical observations**, reflecting the expert's opinion, especially for tail distribution.

There is an urgent necessity for Asia Pacific insurance companies to start collecting **operational loss** data.

4. Measuring operational risk: Modeling

Regarding the **methodologies** used to evaluate the capital solvency requirement associated with operational risk, there are generally **three** classes of approaches:

- **Frequency severity** / Monte Carlo / AMA (Advanced Measurement Approach);
- **Stress testing** / scenario analysis approach; and
- **Bayesian** / causal approach, also know as non-linear models.

4. Measuring operational risk: Modeling

- Frequency severity / Monte Carlo / AMA (Advanced Measurement Approach)
 - **Model description**
 - A 2-step approach:
 1. Model operational losses' **frequency and severity** for process i and risk k

$$S_{i,k} = \sum_{j=1}^{N_{i,k}} X_{i,k}^{(j)}$$

With:

 - $N_{i,k}$: number of losses from process i and risk k
 - $X_{i,k}^{(j)}$: cost of loss j from process i and risk k
 - $S_{i,k}$: sum of losses from process i and risk k
 2. **Total losses distribution**
 - Find CDF of S:
 - If N follows geometric distribution and X exponential
→ we can find analytical expression
 - Else: Panjer algorithm, Monte-Carlo, etc.
 - Basel II's AMA is an option for banks to develop their own operation risk model. Most of the time, it is based on **frequency severity** model.

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4. Measuring operational risk: Modeling

- Frequency severity / Monte Carlo / AMA (Advanced Measurement Approach)
 - **Circumstance where the model is relevant**
 - When **historical loss data is rich enough** to perform statistical modeling on both frequency and severity
 - **Type of data required**
 - **Historical loss data for each risk and process** (to calibrate the model)
 - **Limitations**
 - Methodology adequate only for high frequency / low severity risks as observed **data must be sufficient**
 - Relies only on past data → **what about new / emerging risks?**
 - Risks simulated independently → **how to aggregate?**
 - Add empirical distributions
 - Allow diversification benefit: correlation matrix, copulas, add VaRs, etc.

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4. Measuring operational risk: Modeling

- Stress testing / scenario analysis approach
 - **Model description**
 - A 4-step approach:
 1. For every risk, ask various departments and / or business units to **build scenarios** (from their expertise) to model for instance:
 - a. Average frequency
 - b. Average severity
 - c. Extreme severity
 2. **Selected adequate distributions** for a, b and c
 3. Estimate the distributions' **parameters**
 4. **Simulate** the total loss for each risk (e.g. Monte-Carlo)

4. Measuring operational risk: Modeling

- Stress testing / scenario analysis approach
 - **Circumstance where the model is relevant**
 - **When historical loss data are not substantial enough** to use any purely statistical method, like **emerging risk**.
 - Good to assess **high severity risks**
 - **Type of data required**
 - Bottom-up approach: **experts knowledge** used to encompass a wide and credible spectrum of quantified scenarios.
 - **Limitations**
 - Possible **high dependency on qualitative** impressions.
 - **Difficult to conduct back tests** as historical loss data is not available.

4. Measuring operational risk: Modeling

- Bayesian and Causal approach
 - **Model description**
 - This model **derives from the scenario based models**, it is based on an qualitative analysis and the determination of scenarios.
 - The Bayesian approach adds an **analysis of the causal relationships across operational risks** that allows measuring certain correlated risks that are not captured in data bases.
 - Once the Bayesian network built, a 3-step approach is conducted:
 1. Exposure assessment: Collect business units' views on the number of items exposed to operational risk for next year (Maximum of 1 loss per risk per year).
 2. Frequency assessment
 - Binomial distribution $B(n,p)$ with:
 - n: number of exposed items
 - p: probability to estimate (empirically, from experts or combined)
 - 3. Severity and KRI definition assessment:
 - 3 scenarios: optimistic / best estimate / pessimistic (25%/50%/25%)
 - Build empirical distribution on historical loss data where data exists.

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4. Measuring operational risk: Modeling

- Bayesian and Causal approach
 - **Circumstance where the model is relevant**
 - When we combine availability of:
 - **Historical loss data**
 - **Valuable experts knowledge from experience**
 - Model external / new / emerging risks with scarce data available
 - Allows to identify key variables that impact the most the company and then concentrate the risk mitigation efforts on those variables.
 - **Type of data required**
 - **Historical loss data**
 - **Conditional probability**
 - **Experts knowledge**
 - **Limitations**
 - **High reliance on conditional probability** (i.e. probability that risk occurs **knowing** exposure X), ie expert knowledge.

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5. Conclusion

- Depending on the **management's ambition**, **Operational Risk management** can be either:
 - A **compliance exercise**, easier and cheaper to execute; or
 - A **strategic exercise**, requiring significant resources.
- The **compliance exercise** will be based on:
 - **High level** understanding of key Operational Risks;
 - Prevention and post-mitigation; and
 - **Benchmark** based quantification.
- The **strategic exercise** will rely on:
 - A proper **governance framework**; and
 - Own processes covering **identification, measurement, monitoring and reporting**.

5. Conclusion

- Next steps:
 - **Survey** about operational risk management practices;
 - Assessment of the **operational risk charge impact on the capital requirements** for Singaporean insurance companies according to:
 - Singapore RBC2;
 - European Solvency 2; and
 - APRA LAGIC.
 - **Ongoing dialogue** with the MAS
 - For the purpose of **modeling, collecting** operational risk loss **data**...

5. Conclusion



WE WANT YOUR DATA!

Appendixes

1. Most significant Operational losses in the FS industry
2. Capital requirement for Operational Risk - examples
3. Managing operational risk:
 - a) Example of ORM governance structure
 - b) Key Risk Indicators (KRIs)
 - c) Risk & Control Self Assessment (RSCA)
 - d) RSCA Overview
 - e) Example of Risk Assessment Heat Map
 - f) Risk Event Data Base
4. Bibliography
5. Contributors

Appendix 1: Most significant Operational losses in FS industry

Rogue trader losses					
Institution	Year	Name of trader	Country	Instruments	Loss
Barings Bank	1995	Nick Leeson	UK	Nikkei index futures	GBP 827m
Daiwa Bank	1995	Toshihide Iguchi	Japan, US	US T-bonds	USD 1.1bn
Sumitomo Corporation	1996	Yasuo Hamanaka	Japan	Copper	USD 2.6bn
Allish Irish Bank	2002	John Rusnak	US	Foreign exchange options	USD 691m
National Australia Bank	2003-04	Gianni Gray, David Bullen, Vince Ficarra, Luke Duffy	Australia	Foreign exchange options	AUD 360m
China Aviation Oil	2005	Chen Jiulin	Singapore	Jet fuel futures	USD 550m
Amaranth Advisors	2006	Brian Hunter	US	Natural gas futures	USD 6.5bn
Societe Generale	2006-08	Jerome Kerviel	France	Euro stock index futures	EUR 4.9b
Group Caisse d' Epargne	2008	Boris Picano-Nacci	France	Equity derivatives	EUR 751m
UBS	2011	Kweku Adoboli	Switzerland	S&P 500, DAX, EuroStoxx index futures	USD 2.3bn

Operational failure				Fraud				
Institution	Year	Country	Case	Institution	Year	Country	Case	Loss
Australian Securities Exchange	1998	Australia	Collapse of national network system	Bernard L. Madoff Investment Securities	2008	US	Ponzi scheme	USD 50bn
DBS Bank	2010	Singapore	7-hour island-wide system outage	UBS	2011	UK	Internal fraud: False accounting of unauthorized trade deals	GBP 1.3bn
OCBC Bank	2011	Singapore	4-hour island-wide system outage	DBS Bank	2012	Malaysia	External fraud: Unauthorized withdrawals	Unknown
Mitsui Sumitomo Insurance Company	2012	UK	Corporate governance failings	DBS Bank	2012	Singapore	External fraud: Unauthorized withdrawals	SGD 500k
Coutts	2012	UK	Inadequate controls to prevent money laundering	Barclays Bank	2012	UK, US	Interest rate rigging	
				UBS	2012	UK, US, Switzerland	Interest rate rigging	
				Shanghai Fanxin Insurance Agency	2013	China	Insurance agency scam: Unauthorized sale of fixed-income wealth management products	CNY 500m

Appendix 2: Capital requirement for Operational Risk – examples

- Singapore's MAS RBC 2 (CP June 2012)
 - MAS proposes to incorporate an explicit risk charge to capture operational risk within the RBC 2 framework, calculated as:
 - $x\%$ of the higher of the past 3 years' averages of
 - (a) earned premium income;
 - (b) gross policy liabilities
 subject to a maximum of 10% of the total risk requirement
 - Where $x = 4\%$

(except for investment-linked business, where $x = 0.25\%$ given that most of the management of investment-linked fund is outsourced)

Appendix 2: Capital requirement for Operational Risk – examples

- Europe's Solvency 2 project (QIS5)

$$SCR_{Operational} = \min[0.3 \times BSCR ; \max (Op_{premiums}; Op_{provisions})] + 0.25 \times Exp_{ul}$$

- With:

$$Op_{provisions} = 0.0045 \cdot \max (0; TP_{life} - TP_{life-ul}) + 0.03 \cdot \max (0; TP_{non-life})$$

$$Op_{premiums} = \begin{cases} 0.04 \cdot (Earn_{life} - Earn_{life-ul}) + 0.03 \cdot Earn_{non-life} \\ + \max (0; 0.04 \cdot (Earn_{life} - 1.2 \cdot pEarn_{life} - (Earn_{life-ul} - 1.2 \cdot pEarn_{life-ul}))) \\ + \max (0; 0.03 \cdot (Earn_{non-life} - 1.2 \cdot pEarn_{non-life})) \end{cases}$$

- Exp_{ul} denotes the amount of expenses incurred during the previous 12 months in respect of life insurance contracts where the investment risk is borne by policy holders.
- TP : Technical Provision
- $Earn$: Earned Premium
- $BSCR$: Basic Solvency Capital Requirement

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Appendix 2: Capital requirement for Operational Risk – examples

- Australia (LPS118) – Life insurance

- Operational Risk Charge (ORC) is the combination of a charge for risk business (ORCR), for investment link business (ORCI) and for other business (ORCO):

$$ORC = ORCR + ORCI + ORCO$$

$$ORCR = A \times [\max (GP_1; NL_1) + \max (0; |GP_1 - GP_0| - 20\% \times GP_0)]$$

$$ORCI \text{ or } ORCO = B \times [NL_1 + \max (0; GP_1 - 20\% GL_0) + \max (0; C_1 - 20\% \times GL_0)]$$

- Where:

- A is 2% for statutory funds of specialist reinsurer and 3% for other funds
- GP_t is gross premium for the 12 months ending on the reporting date at time t
- NL_1 is the net adjusted policy liabilities at the reporting date
- B is 0.15% for statutory funds of specialist reinsurer and 0.25% for other funds
- GP_1 is gross premium income for the 12 months ending on the reporting date at time 1
- GL_0 is gross adjusted policy liability for the 12 months ending on the reporting date at time 0
- C_1 is all gross payments to meet liabilities to policy owners for the 12 months ending on the reporting date a time 1.

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Appendix 2: Capital requirement for Operational Risk – examples

• Australia (GPS118) – Non Life insurance

- Operational Risk Charge (ORC) is the combination of a charge for inward reinsurance business (ORCI) and for not inwards reinsurance business (ORCNI).

$$ORC = ORCI + ORCNI$$

$$ORCI = 2\% \times [\max(GP_1; NL_1) + \max(0; |GP_1 - GP_0| - 20\% \times GP_0)]$$

$$ORCNI = 3\% \times [\max(GP_1; NL_1) + \max(0; |GP_1 - GP_0| - 20\% \times GP_0)]$$

- Where:
 - GP_t is gross premium revenue for the 12 months ending on the reporting date at time t
 - NL_1 is the net adjusted policy liabilities at the reporting date

Appendix 2: Capital requirement for Operational Risk – examples

• Japan – Life insurance

- Operational risk is captured by the Management Risk Capital (MRC):

$$MRC = (R1 + R2 + R3 + R7 + R8) \times (\text{Risk factor})$$

- Where:
 - $R1$ is the risk capital for insurance risk
 - $R2$ is the risk capital for interest-crediting risk capital
 - $R3$ is the risk capital for asset risk
 - $R7$ is the risk capital for products with minimum guarantee benefits
 - $R8$ is the risk capital for insurance risk relating to third-sector products

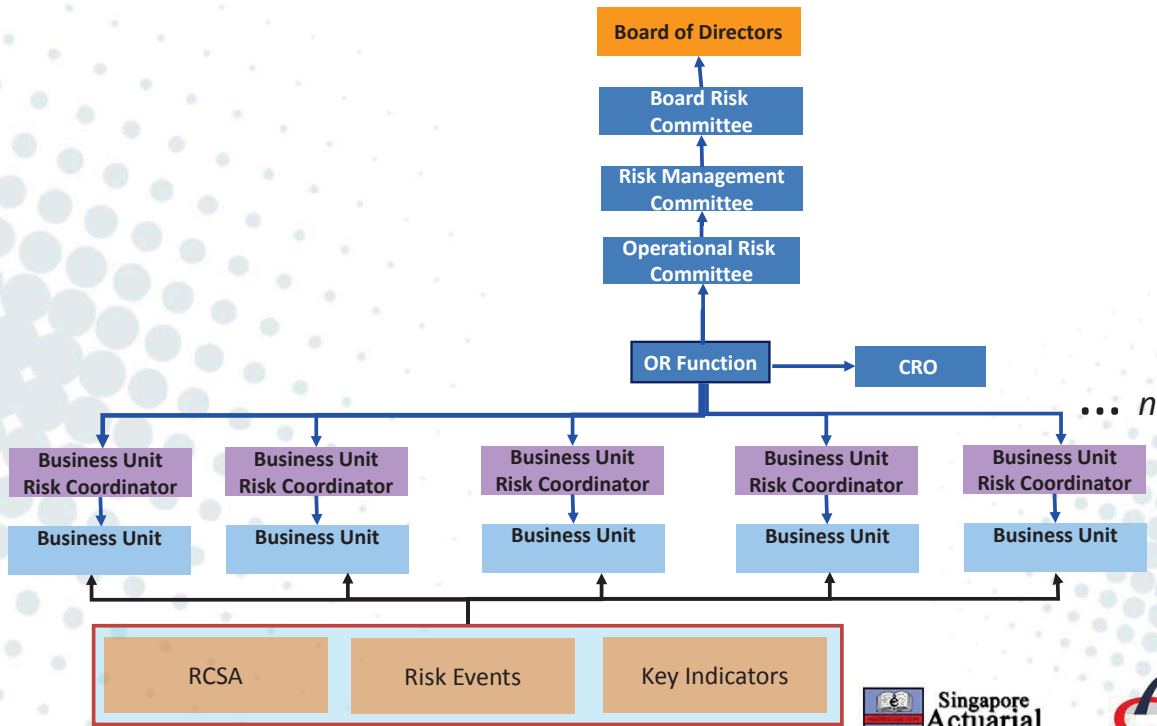
• Taiwan

- Operational risk charge (C4) is:

$$C4 = x \times \text{premium income} + 0.25\% \times \text{assets under management}$$

- Where $x=0.5\%$ for life business, 1% for annuity business and 1.5% for all other business.

Appendix 3: Example of ORM Governance Structure



Appendix 3: Defining ORM Process – Key Risk Indicators (KRIs)

Key Risk Indicators are measures used to monitor and manage an entity's level of risk and the effectiveness of controls

- ❖ KRIs should monitor both **inherent** and **residual** risk levels
- ❖ KRIs should focus on both the **internal** and **external** environment
- ❖ KRIs should be **S.M.A.R.T.** (specific, measurable, actionable, relevant, and timely)
- ❖ Each KRI should be approved through established **governance** channels

Building KRIs – key questions to ask!

- ✓ **Is the indicator useful?** Meet with key stakeholders to identify data being used in business today that can help us identify potential risks (e.g., IT/System Logs, Net Promoter Score, compliant logs, Internal event database, outstanding reconciliation items)
- ✓ **Is the indicator subjective?** Indicators should, as far as possible, be objective, not subjective
- ✓ **Is the indicator practical?** If data is not available or reportable, the cost of designing/ capturing new indicators should be weighed against the potential benefit
- ✓ **Is the indicator linkable to business?** Linking indicators to the business model should assist in identifying risks and opportunities
- ✓ **Is the indicator understandable?** The aim should be for non-subject matter expert to be able to pick up and understand the information with little or no explanation required
- ✓ **Is the indicator measurable?** If you can't define tolerance levels or unable to develop measurable actions to meet tolerance the indicator is of no real use

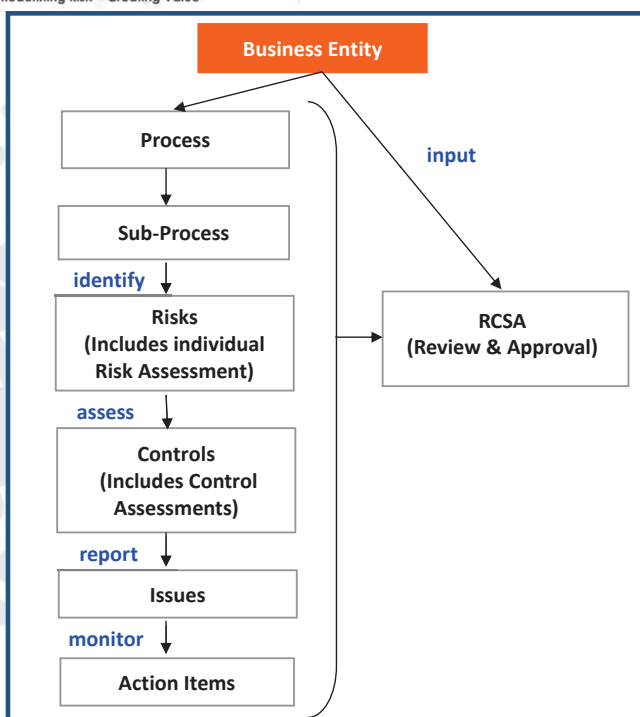
RCSA is a process to assess risks and evaluate the effectiveness of the business control environment.

- ❖ helps to create a robust framework for operational risk management (ORM) in the organisation
- ❖ The RCSA process supports the **identification**, **analysis**, **reporting** and **monitoring** of key processes, risk, controls and remediation plans across the organisation
- ❖ The four data forms which include **risks**, **controls**, **issues** and **action items** are created to collect risk data from process owners in each business entity
- ❖ With the implementation of a broad, accurate and comprehensive risk data aggregation, we are positioned to perform full scale risk analysis to minimize and mitigate operational risks

Building RCSA Framework

- ✓ To implement rigorous quality control measures in data capturing and management processes
- ✓ To conduct process that fully meet local regulator expectations for self assessment framework
- ✓ To incorporate all compliance related risk into a single reporting software platform
- ✓ To increase focus on fewer “critical” risks but nonetheless aggregate exposure to key risk themes
- ✓ To constantly review risk measurement metrics, bearing in mind the limitation of reporting tools such as heat maps (e.g., it is one-dimensional, not risk weighted)

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Key Issues:

The RCSA process is a sub-set of a broader, strategic “total quality management” continuous process improvement program.

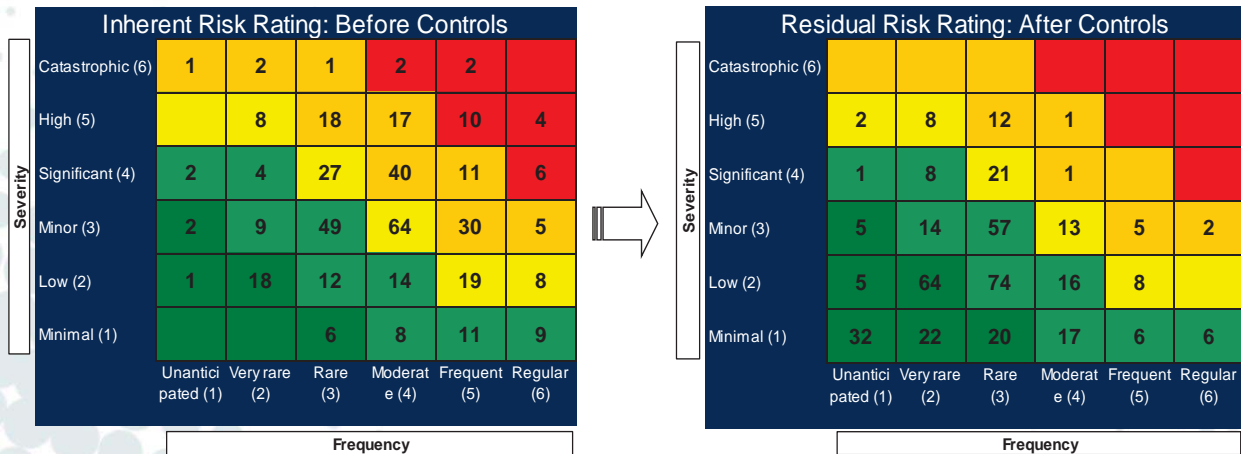
The method calls for self-identifying breakdowns in processes and controls to improve risk management.

In the absence of a broader strategic continuous process improvement program, this methodology is challenging to implement.

RCSA is a “living” tool that seeks continuous improvement of the process

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Appendix 3: Defining ORM Process – Risk Assessment Heat Map (Example)



Limitation of Heat Maps:

- ❖ Heat mapping process is **one dimensional** (i.e. can't assess *correlation & interaction* between several risks)
- ❖ Heat mapping process **does not weight** the risk ranking
- ❖ Even if risk weighted, the uni-dimensional feature limits the ability to assess exposures that may present a **compounding of risk**

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Appendix 3: Defining ORM Process – Risk Event Database

An **Operational Risk Event** is the materialization of operational risk that leads to one or more impacts. These events can happen at any time and in any part of the business. An impact can be either:

- ❖ **Financial** – direct financial loss resulting in a negative cash flow
- ❖ **Non-financial** – reputational damage, business disruption, regulatory intervention

A **Risk Event Database** is the centralised depository where operational risk events are being captured, stored and analysed.

- ❖ Both **internal** and **external** events which impact business should be captured
- ❖ Consider changes in business which can lead to an increase in risk **likelihood** and/or **impact**

Building a Risk Event Database

- ✓ Define an operational risk event, and use it **consistently** across the organisation
- ✓ Define **thresholds/criteria** for risk event notification
- ✓ Report and document risk events information in a **centralised database tool** (e.g., OpenPages)
- ✓ Risk Event descriptions should be objective, cohesive and must **provide enough information** to allow understanding of the event/loss (e.g., describe incidents in terms of financial impact and/or non-financial impact, no personal opinion or speculations, etc)
- ✓ Track and **monitor action taken** to address risk event and actions to prevent reoccurrence

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Appendix 4: Bibliography

- UK GIRO WP 2004, Quantifying Operational Risk In General insurance Companies
- UK Life ORWP 2006, Quantifying operational risk in life insurance companies
- ABI 2009, Analysing operational losses in insurance
- ABI 2010, Scenario analysis of operational risk in insurance
- SOA 2010, A New Approach for Managing Operational Risk
- GAMONET 2011, Modelling operational risk in the insurance industry
- SANTOS 2012, Modeling macroeconomic effect and expert judgments in operational risk: a Bayesian approach.
- BARROS 2012, Capital assessment of operational risk for the solvency of health insurance companies
- CORRIGAN 2013, Operational Risk Modeling Framework

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Appendix 5: Contributors

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